MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120 May 1997

3D AEROBATICS—HOW DO THEY DO THAT?

Scale Masters...

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MAY 1997 • VOLUME 125, NUMBER 5

MODEL AIRPLANE NEWS

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Small Steps Fly-In—page 60

Chipmunk—page 68

ON THIS PAGE: *top—Nick Ziroli Jr.'s Avenger takes off at the Scale Masters; center—a small Texan at the SMALL Steps 9th Annual Fly-In; bottom—this Ohio R/C Chipmunk is reviewed by Gerry Yarrish in this issue.*

ON THE COVER: *main photo—Randy Nelson's Agwagon received the Pilots' Choice award at Scale Masters 1996. Inset left: Charlie Nelson's Waco, Dick Hansen's Albatros and Garland Hamilton's T33 were just a few of the highlights at the 1996 Scale Masters. Inset bottom: Gerry Yarrish and Larry Marshall review the Hangar 9 Cubs from Horizon products. See page 20 for coverage.*

Reviews

Columns

EDITORIAL

by LARRY MARSHALL

SPRING HAS SPRUNG

Yippee!! Those of you who live in more southern climes may have difficulty understanding my excitement. But for those of us familiar with snow and cold, this is spring, the time of year that groundhogs come up from their burrows, presumably to check the surroundings for their shadows.

Similarly, we modelers climb from our basement shops to investigate our own environment. We're not looking for shadows, though. We're checking for clear runways and good flying weather. Poised with the labors of our winter's work, we hope the first flights of our new models will occur soon.

Mike Winter readies his Sopwith Pup at the Scale Masters.

But the first few weeks of the flying season generate mixed emotions at most club fields. Those who have carefully tested and re-tested every aspect of their new aircraft prior to heading to the field are generally elated by "flew right off the board" performances. Others wonder why these guys are always so "lucky."

Others don't share these experiences. They are bitten by problems that result in crashes. As postmortems are done on these crashes, we often hear, "The battery failed," "The ailerons were hooked up backwards," "I thought those hinges were glued in well," or "The engine quit." Most of these disappointments could have been avoided with a bit more effort during the preparatory phase, and these flyers could have been "lucky," too.

This year, when you head out for those first flights, ask yourself whether you've checked all the little things that make an aircraft fly reliably. Are the hinges glued solidly? Are the servo linkages functioning and slop-free? Does the engine/fuel system function flawlessly? Do you have the plane balanced properly? Would you be willing to sit in this aircraft as it left the ground?

When it comes to actually flying the plane, objectively ask yourself whether you're the guy who should fly it the first time. Some people get very nervous during this process; some don't. Some are better than others at handling out-of-trim aircraft. If you do get nervous and/or your flying abilities are limited, maybe it's best for someone else to pilot the first flight of your aircraft.

If you do fly the plane, don't just take it to the end of the runway, open the throttle and yank it off the runway. Advance the throttle slowly, watching and reacting to what the plane does. It can tell you a lot about its flight tendencies long before it leaves the ground. Once in the air, trim the plane as well as you can. If all is going well, climb to altitude, and check the slow-flight and stall characteristics of the aircraft. Unless you know about this part of the flight envelope, you may well be surprised during your landing approach, and the results will not be pleasant.

Doing these small things will go a long way toward improving the probability that you'll be flying that plane throughout the summer. Most of all, have fun flying this summer; I'm sure it's going to be a good one.

3D AEROBATICS & SCALE MASTERS

Those of you looking for a new flying challenge this spring will want to read the first of a series of articles by Mike McConville. Mike will discuss some of the extreme aerobatics that are being popularized by TOC pilots. These seemingly impossible maneuvers are being added to TOC freestyle routines, and they offer up a set of interesting challenges for sport flyers as well.

It's difficult to do photographic justice to the model masterpieces flown at prestigious scale competitions. But Jerry Nelson has abilities with a camera that most of us can only dream of possessing. We're fortunate to be able to present his coverage of the 1996 Scale Masters competition; I think you're going to like it. ✦

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we can not respond to every one.

GIANT-SCALE RACING

I'm writing in response to your article on the Madera '96 giant-scale air races appearing in your February '97 issue. In that article, you congratulate Bill Cunningham on his achievements in the field of Unlimited racing, which I believe he is very deserving of. He is, I think, the only pilot to have won three or more Unlimited Gold or Platinum titles. He and the A-cubed team have done more to raise the bar than any other team in the field.

I must take issue, however, with the fact that in two separate places in your article, on page 60, the statement is made that "Bill [Cunningham] won every Unlimited Class Gold race in the 1996 season ...." You have obviously not been made aware of the results of the 1st Annual Giant Scale World Championship races held at Rio Vista during the Labor Day weekend. Most of the top teams were there, including Bill Cunningham with his Vendetta and Lancair, Dennis Crooks with his P-38, Dave Shadel, Richard Veranno and many others. Bill Cunningham did win the Super Unlimited class (for Lancairs) and also competed in the Unlimited Gold class with his Vendetta. He and his Vendetta made it to the trophy round, but he did not win. That title was won by a Fiat G-59 owned and built from scratch by Paul Ross. I was the pilot of that airplane.

As a pilot of the R&R racing Team's Race 00 Unlimited Class Fiat, I am very disappointed to see this kind of error in your publication. Besides Mr. Cunningham, I am the only person to have won an Unlimited Gold Class event this year, and one of only four people to have won two such events since the inception of this type of racing (having won the Madera Gold in '92). As such, the statements made in your article diminish the accomplishments of me, of Paul Ross, who builds all the race planes I fly, and of the entire R&R Racing Team. We would appreciate a correction and an explanation.

DON RICE
San Diego, CA

Your well-written letter serves to correct the error, Don; thank you for writing. As for an explanation, the best I can say is that we goofed. We try very hard to present accurate information, but we're not infallible. In the case of my Madera article, I sent a copy to GSARA so they could check the accuracy prior to publication. Sorry for the error. GY

OTTER DOCUMENTATION

I was on a recent caribou hunting trip in upper Quebec, Canada, and flew into our hunting camp in a de Havilland DHC-3 Otter floatplane. Do you know where I can get scale drawings and information to create an accurate, detailed model of this particular aircraft?

PAUL M. ADAMS
Warrensburg, IL

Ah, the "King Beaver," or at least that's what the Otter was called while de Havilland was in the design stages. These big bush planes are near and dear to my heart. I can't provide an exhaustive answer to your questions about documentation, but maybe I can get you started. You can get color Foto-Paaks of several different Otters from Bob Banka of Scale Model Research: (714) 979-8058. These provide overall color schemes as well as detail photos of the aircraft. I'd also highly recommend a book called "The DeHavilland Canada Story" by Fred Hotson; published by CANAV Books (ISBN 0-9690703-2-2). It's a great book and includes considerable coverage of the Otter as well as other de Havilland bush planes. Hobbycraft produces a good plastic kit of the Otter, and the model, as well as the 3-view, can serve as documentation for an R/C project. LM

SCALE PAINT SCHEMES

I have seen in construction manuals of older kits a mention of "Profile Publications" as a reference to scale color schemes. I haven't been able to find them. Are they still around? I am currently working on a stand-off scale of a DH82 Tiger Moth and can't decide on the color. I know about the photo packs some companies offer, but how about a general idea on the colors for $10 or $20, instead of one photo for one color scheme for $10. Please help.

Kenneth Daniel
Beckley, WV

Most of the Profile Publications are no longer available. I wish I could direct you to a really inexpensive source that would give you a bunch of color schemes for Tiger Moths, but I can't. I've found over the years that I spend a considerable amount of money on documentation of aircraft, and I have yet to regret any of those expenditures.

But your letter underscores a problem that all scale modelers face. Scale documentation is at least a two-step process. The first step is to identify which aircraft we want to model, and only secondarily do we devote our efforts toward documenting that aircraft. Photo pack suppliers, on the other hand, help us deal with the second part of the puzzle.

But let's look at your Tiger Moth color scheme problem. You want to look at a bunch of color schemes so you can make a choice. I took a quick look at this question. Hopefully, the results of this few minute survey will give you some ideas about how to find a color scheme.

There are two major texts on the Tiger Moth that I know of, though I'm sure there are others. These are "Tiger Moth: A Tribute" by Stuart McKay (ISBN 0-517-56864-0) and "Tiger Moth Story" by Alan Bramson and Neville Birch (ISBN 0-906-393-19-1). Books like these can provide a good start, and they certainly supply a good dose of incentive for anyone starting a scale project.

I also decided to check out the Web to see what I could find. At http://ourworld.compuserve.com/homepages/zoneheights/#TOP you'll find The Tiger Club—a club devoted to flying Tiger Moths. They've got color photos of Tiger Moths online. This and a couple other sites yielded Moths painted in yellow, red/silver, blue, military camouflage, and even Canadian trainer colors.

But you know what? For a mere $8 you can get a book ... er ... catalogue from Scale Model Research; it lists 31 different Gypsy Moth Foto-Paaks. The descriptions of these planes provide a bunch of paint schemes to ponder, and I'm sure that if you give Bob Banka a call, he will help you narrow things down to a color scheme that will please you. LM

AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

Superlative ... not Expensive

Those quality European Firepower and Maxflash glow plugs I've been hearing so much about are finally available here in the U.S. from Wildcat R/C Fuels. Both of these plugs feature five cooling fins and excellent electrode copper seal and are available in six heat ranges. Range designations are stamped on the plug's body for field-box identification. The Firepower series is designed primarily as a contest plug with a high-strength element. Being platinum-rich, the Maxflash series plugs are catalytically super-active—great news for 4-stroke lovers like me. Designed to give optimum throttle response, the Maxflash is not only great for "low-tick-over" engines like the 4-stroke, but will also be welcomed where mid-range response is so vital, as in helicopters and cars. Retail prices of the Firepower and Maxflash are $7 and $5.50 respectively. For more information, contact CAE Inc., Wildcat R/C Fuels, 3005 Park Central W., Nicholasville, KY; (606) 885-5619; fax (606) 885-8549.

Instant Immelmann

Hobby Lobby's new Fun-Fokker is ready-built and covered. Just install your Speed 400 motor, electronic and radio gear and go FLY!

Taxiing around, taking off and shooting touch-and-go's with the Fun-Fokker can turn a local ball field or an empty parking lot into a WW I aerodrome. Now that sounds like serious Fokker fun! The Fun-Fokker also happens to be an excellent, easy-to-fly R/C trainer. Included in the kit are landing gear, wheels, pushrods, clevises and control horns. Specs are 38-inch wingspan, 251 square inches of wing area, 29 inches long and about 20 ounces flying weight.

Another affordable, ready-built and covered Hobby Lobby model for the Speed 400 is the new, very lightweight Demant.

Some of its notable soaring design features include high-lift, flat-bottom airfoil, tapered wing with sharp, low-drag leading edge, high T-tail (unique in Speed 400 class) and large wing area for its class. Specs are 63-inch wingspan, 380-square-inch wing area, 33.5 inches long and about 23 ounces flying weight. Both models require three functions: rudder, elevator and motor control.

These handmade Hobby Lobby models are of lightweight all-balsa construction and imported from the Czech Republic. They come just as you see the Demant—pictured here to the right. Both are priced at only $128. Contact Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

ELECTRIC EURO-LIFT

This is a 1/35-scale C160 Transall model that produces the excitement of twin-engine power with the relaxed confidence electric motors have to offer. This 45-inch-wingspan ARC (almost ready to cover) is designed for two of the inexpensive Graupner Speed 400 motors and is suited to 7- or 8-cell packs. The kit contains a gel-coated, carbon-fiber-reinforced, epoxy/glass fuselage and nacelles. The one-piece wing is presheeted and ready for covering. Undercarriage kit is optional. For more information, contact Unbeaten Path Imports, P.O. Box 271, Oconomowoc, WI 53066; (414) 569-5711 (Mon. to Thu., 7 p.m. to 11 p.m. CST); fax (414) 569-5915.

Kyosho PT-19

The venerable Fairchild PT-19 now joins the Kyosho Super Quality Series. So far, we've done "Field & Bench" reports on the J-3 Cub and the Spacewalker from this series. Both of these lightweight, well-constructed, all-wood models proved to be exactly what their name implies—super-high quality. There's no reason to believe the new PT-19 is not going to be up to the same, attention-to-detail standards. Kyosho's Super Quality Series planes really seem to be designed by modelers for modelers. Kyosho's version of this historic primary trainer comes covered with a five-color scheme in iron-on film and features a two-color, pre-painted ABS cowl. The model has a 61¾-inch wingspan and is designed for .32 to .40 2-stroke or .48 to .53 4-stroke engines.

Also coming in the Super Quality Series is a .26 4-stroke-size Cap 232. No word as of yet on Cap availability here in the States. The Kyosho Super Quality Series is distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61820-9021.

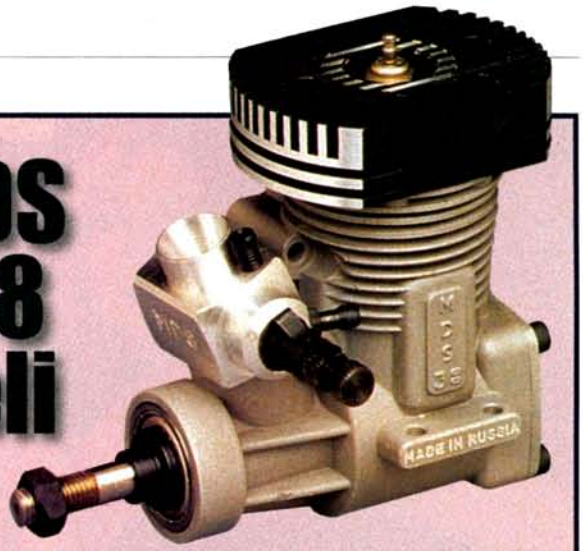
Buddy in Your Box

It's always great, and infinitely safer, to have a buddy with you to hold your airplane while you run up the engine. Sometimes, however, your buddy isn't around. Then again, if lately he's been overly critical of your flying or has been endlessly crunching on smelly garlic codfish chips, you don't particularly want the annoying SOB around anyway! In either case, Midwest Products has the perfect stand-in for your buddy—annoying or otherwise. The Aero-Mate is like having an extra pair of hands in your flight box ready to securely hold your model during engine starting and adjusting. Built from ¾-inch steel tube (18 gauge), the cradle section is padded to protect your model's finish while holding it securely. The ⅜-inch-thick spike anchor is angled forward at 40 degrees to provide excellent hold. Cradle width is 8 inches, cradle height is 13 inches, and spike anchor is 12 inches. A white powder coating prevents corrosion. For more info, contact Midwest Products Inc., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342-0564; (800) 348-3497; fax (219) 947-2347.

The Wild Ones from Lanier!

Are you looking for some wild aerial contortions topped off with super-gentle landings? If so, Lanier's new Pro-Twister and Pro-Cub are for you. Both of these designs are torque-rolling, inverted-spinning, hover-capable airshow machines that are very simple to build. Both are also all-balsa built-up kits incorporating Lanier's latest technology, which includes AutoCAD-generated plans with laser-cut and CNC router-cut interlocking construction. Some of the features are tabbed rib wing construction, fully symmetrical airfoils, easy-to-follow instructions and fast assembly with a minimum of parts. Lanier's philosophy on hardware?—everybody likes something different, so why not keep the kit's cost down by leaving it out while letting the builder choose the hardware he prefers. The Cub has a 50¼-inch wingspan with 688 square inches of area, and the Twister has a 41½-inch wingspan with 664 square inches of area. Both call for .32 to .46 2-stroke or .40 to .56 4-stroke engines. Contact Lanier RC Inc., P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.

MDS .38 Heli



According to Estes Industries, American distributor of MDS, you don't have to spend lots of $$$ to increase the performance of your .30-size helicopter with the new MDS .38H heli engine. Designed specifically for .30-size helicopters like the Concept, Shuttle and Enforcer, the MDS .38H features true ABC piston/sleeve technology, dual ball bearings, Schnuerle porting and Aeromix twin-needle carb. The best feature, however, is the price—$119 suggested retail. For more information about the entire MDS line, contact Estes Industries, 1295 H St., Penrose, CO 81240; (719) 372-6565.

A MiG-25 now joins LDM's Combat Fighter Series, which includes the A-10, F-15, F-16 and F-18. Like the others, the Foxbat features prefabricated, bolt-together, modular construction and can be built and ready to cover in as little as eight to 10 hours. LDM states the Foxbat's maneuverability is breathtaking with a roll rate of two rolls per second and unlimited vertical performance with a good 2-stroke .40. Specifications: wingspan—43.5 inches; area—500 square inches; flying weight—4 to 4½ pounds; wing loading—18 to 20 ounces per square foot; engines—.40 to .46 2-stroke. Contact LDM Industries Inc., P.O. Box 292396, Tampa, FL 33687-2396; (813) 991-4277; fax (813) 991-4810.

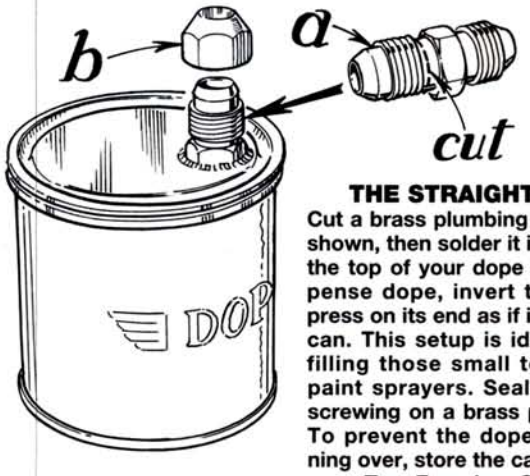
***FLASH!** Due to popular demand, LDM plans to introduce sport-flying versions of their entire Combat Series line. These models will include landing gear, motor mounts and all necessary hardware for steerable nose gear. See them at the Toledo Show.*

COMBAT COMRADE?

Hints & KINKS

by JIM NEWMAN

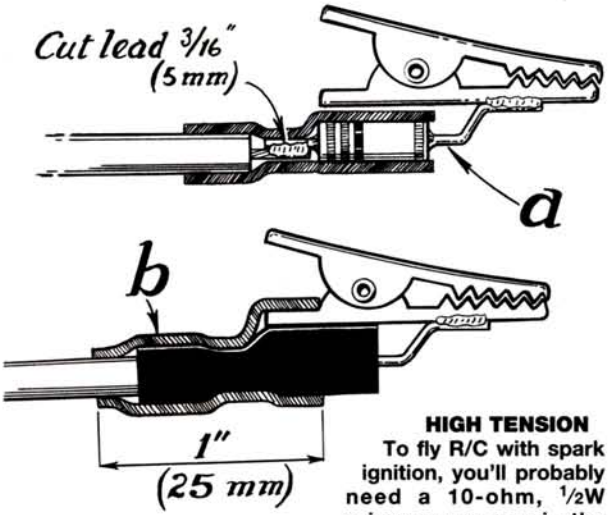
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



THE STRAIGHT DOPE

Cut a brass plumbing fitting (a) as shown, then solder it into a hole in the top of your dope can. To dispense dope, invert the can and press on its end as if it were an oil can. This setup is ideal for filling those small touchup paint sprayers. Seal the can by screwing on a brass pipe cap (b). To prevent the dope from skinning over, store the can inverted.

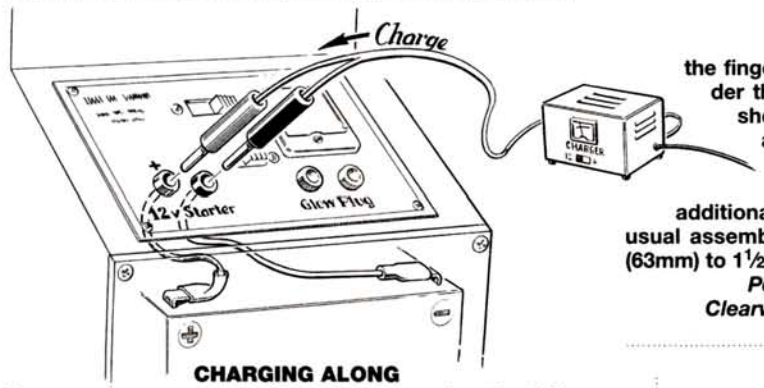
Tom Faragher, Camarillo, CA



HIGH TENSION

To fly R/C with spark ignition, you'll probably need a 10-ohm, ½W noise suppressor in the plug lead. Trim and smooth off the finger pad of a miniature crocodile clip, then solder the resistor as shown, making sure there is a short straight portion at (a). Cover the resistor and the end of the lead with a shrink-sleeve, then add a second shrink-sleeve (b) to overlap the clip and the lead for additional support. This shortens the usual assembly from 2½ inches (63mm) to 1½ inches (28mm).

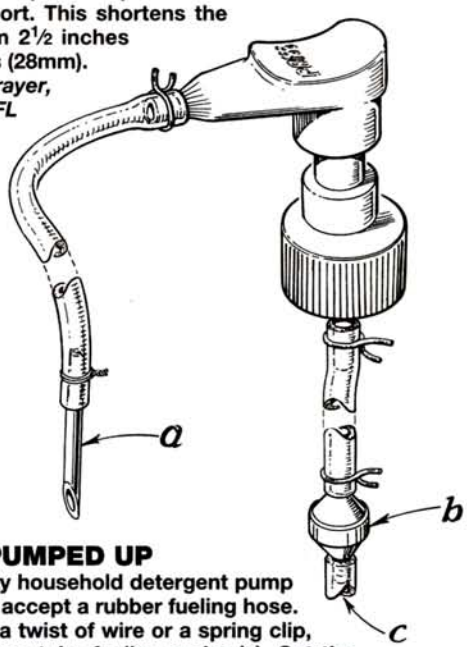
Peter Strayer, Clearwater, FL



CHARGING ALONG

You can charge your 12V starter battery using the 12V outlets on your field box, but *be sure to observe the correct polarity (red to red, etc.).* Now you don't need to remove the front end panel each charging session. If yours is a wet cell, replace the wooden front panel of your field box with Plexiglas® so that you can check the electrolyte levels.

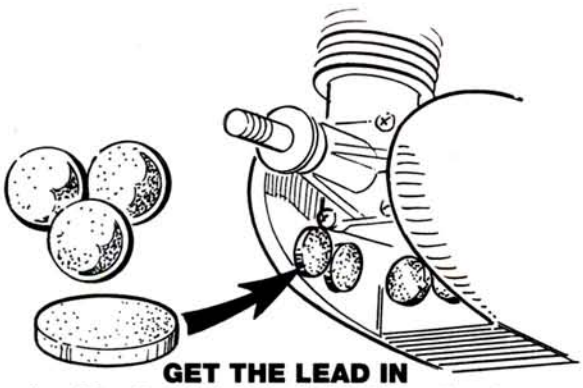
Bill Cattin, Dearborn Heights, MI



PUMPED UP

A high-capacity household detergent pump can be filed to accept a rubber fueling hose. Secure it with a twist of wire or a spring clip, then add a brass tube fueling probe (a). Cut the plastic dip tube and replace it with a rubber fuel line with a filter at the bottom (b). Note the "fish mouth" cut into the short sleeve (c) to prevent the line from closing against the jug bottom.

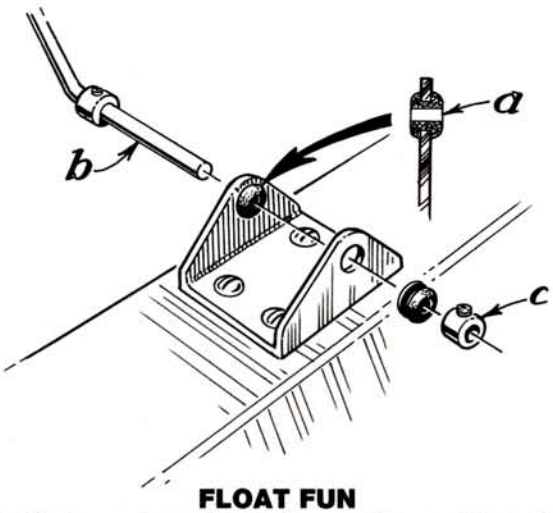
Wayne Tarr, Hamilton, New Zealand



GET THE LEAD IN

For fine CG adjustment, flatten lead BBs with a hammer, then glue them inside the cowl with a smear of PFM or similar gooey glue. This former SPAD driver recommends #00 buckshot.

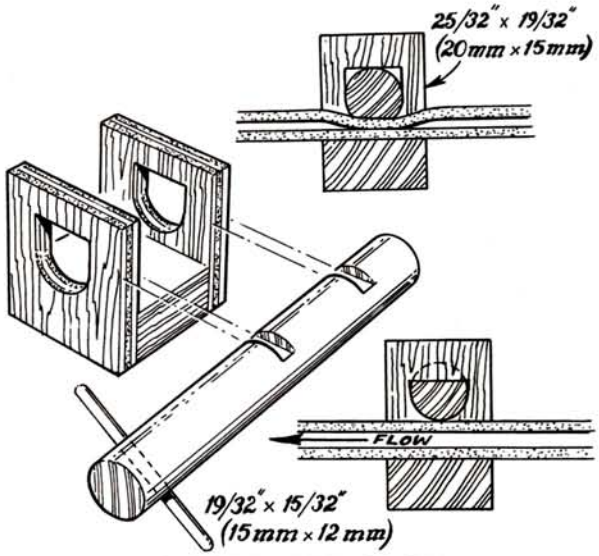
Tom Hastings, Toledo, OH



FLOAT FUN

The aluminum channel came from a shower door project and uses nylon screws in hardwood blocks that are embedded in the float. The rubber electrical grommets (a) eliminate radio frequency "noise" caused by metal-to-metal contact with the gear axle (b) and stop vibration, which can loosen the collars (c).

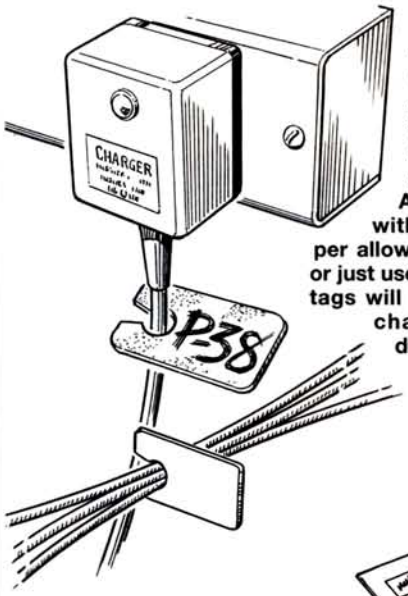
Willie Gardner, Van Nuys, CA



NO-COST FUEL COCK

This fuel shutoff uses 5/16-inch (8mm) dowel, 1/8-inch (3mm) birch plywood and 1/4-inch (6mm) hardwood block. Drill a 5/16-inch hole in the side plates, and file out the flats. File 1/8-inch (3mm) deep matching slots in the dowel, then glue in a music-wire T-bar. Turning the dowel causes it to cam down and squash the fuel line, making engine shutdown easy.

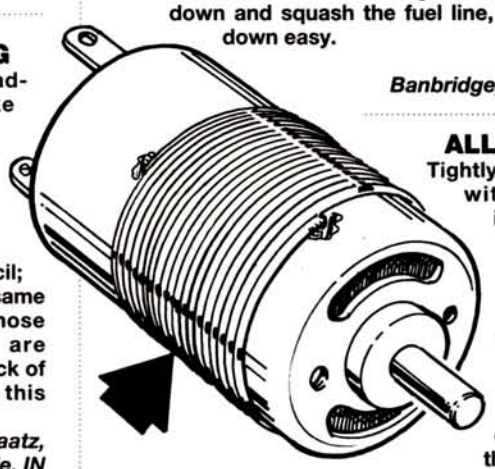
Jack Thompson, Banbridge, Co. Down, N. Ireland



PLAYING TAG

Those plastic bread-wrapper tags make great identity tags for the multitude of chargers in your power strip. A light sanding with 600-grit sandpaper allows the use of a pencil; or just use a wax pencil. The same tags will neatly bundle all those charger leads that are draped across the back of the bench, says this vet P-38 pilot.

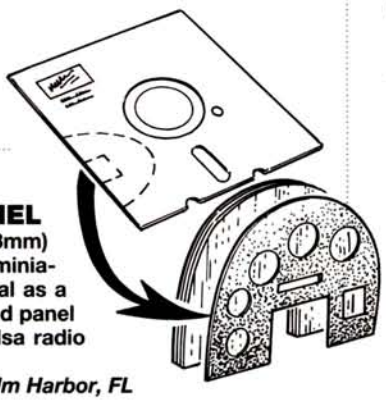
Bill Braatz, Merrillville, IN



ALL WOUND UP

Tightly wind the motor can with a layer of 0.025-inch (0.6mm) diameter galvanized wire, placing the wire directly over the field magnets and securing the ends with a drop of solder. For additional security, the wire can be coated with a thick layer of epoxy or CA. This added flux ring on a 540 or 550 motor can reduce current draw and increase the motor's rpm.

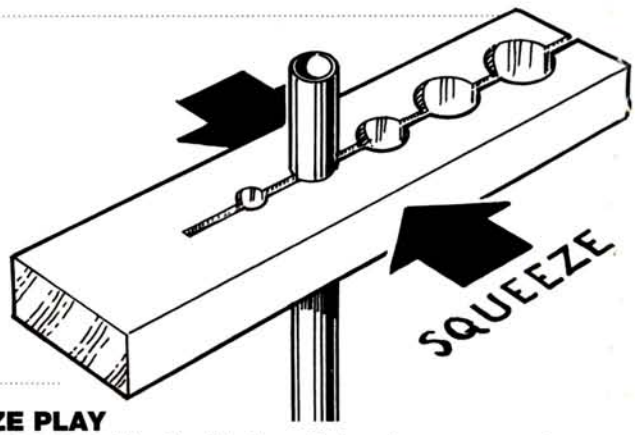
Paolo Moro, Belo Horizonte, Brazil



COMPUTERIZED PANEL

The sleeve of a 5 1/4-inch (133mm) floppy disk has a beautiful, miniature crackle finish that's ideal as a realistic overlay for a plywood panel and as a cover for scale balsa radio boxes, etc.

Bob Dougherty, Palm Harbor, FL



SQUEEZE PLAY

In a hardwood block, drill holes the same size as your various brass tubes. By holding the block gently in a vise, you can grip the tubes without damaging them while you work on them. The original jig measured 1/4x1/2x2 inches (6x13x50mm).

Ben Hartley, Jaffrey, NH

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Mellow-yellow sport-scale fun

HANGAR 9

Piper J-3 Cub ARF

by GERRY YARRISH & LARRY MARSHALL

OK, I'LL ADMIT it (and Larry will, too); I have a secret, deep-down love for the Piper J-3 Cub. I like its particular shade of yellow, I like the shape of its counterbalanced rudder, and I really dig those "eyebrow" air scoops covering the tops of its exposed engine cylinders.

Even in model form, the J-3 for me can't be beat for what it offers—honest, relaxed flying. I think that, though they won't admit it, many modelers feel the same way. Whether you're a pattern flyer, a Sunday sport pilot, or a scale competitor, everyone needs a little Cub time. "Oh yeah, I do remember when flying was supposed to be fun!"

PHOTOS BY WALTER SUDAS & GERRY YARRISH

Larry Marshall (right) and Gerry Yarrish are two happy Cub pilots. Slow formation flying can't be beat!

Twice the fun; two Hangar 9 Cubs. Hey!

IT'S AN ARF

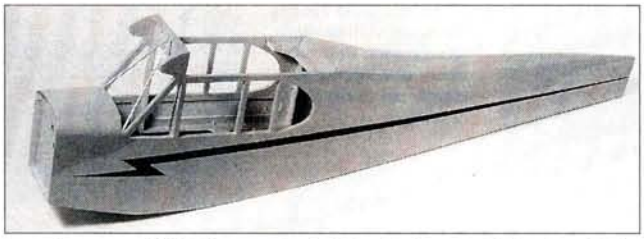
The Hangar 9* Cub is a great-looking, sport-scale ARF that can be assembled in as little as 10 hours. But the finished model really looks much nicer than the ARF label would lead you to believe. Out of the box, the model comes with all the major parts built, covered and hinged. These include the fuselage, the vertical fin, the rudder, the horizontal stab, the two elevator halves, the two wing halves and the two ailerons. Also covered are the four individual wing struts. The covering is CGM* Ultracote, which has been applied very well.

Decals come for the tail as well as the instrument panel, and there's even a pair of Piper decals to stick on the cowl boot. Hangar 9 went to the trouble of applying the large, black registration numbers on the wing for you, and this reduces the headache of final finishing—nice touch. The landing gear is aluminum, and a nice pair of Cub-style wheels is included. The cowl is made of fiberglass and comes already painted with Cub Yellow paint. Basic hardware, balsa pushrods and a photo-illustrated instruction manual complete the kit.

PUTTING IT TOGETHER

• **Wing.** Assembling the wing is standard fare for ARFs, in that the two wing panels are epoxied together with a wooden dihedral brace strengthening the wing root joint. The wing comes completely covered, and the aileron-servo bay needs to be cut open and sealed down around the opening. The aileron servo is attached to a plastic hatch cover, and the hatch is screwed into place over the servo bay with four screws. I found that the openings in the wing were on the small side for the standard-size servos I used. I ended up enlarging the openings about ⅛ inch to fit the aileron servos.

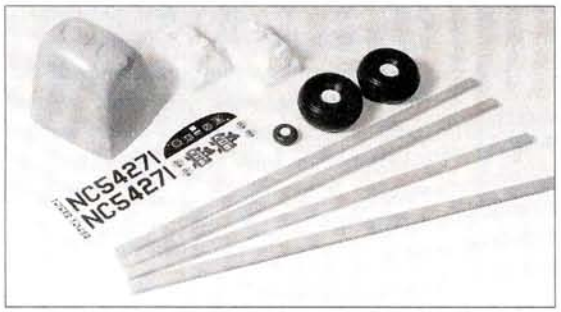
The ailerons in my kit were a bit too long to fit the aileron cutouts in the wing's trailing edge. This may have been because the wing structure shrunk a little after it was assembled at the factory. I simply sanded about an ⅛ inch off each aileron's tip and re-covered the exposed balsa with Ultracote. Once this had been done, I fitted the ailerons, glued in the hinges and made up and installed the aileron pushrods and control horns.



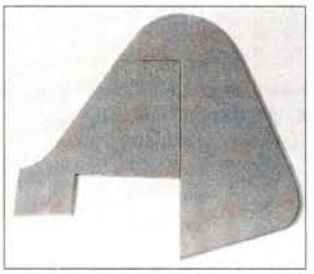
How long would it take you to build a Cub up to this stage? The Hangar 9 ARF Cub fuselage comes like this right out of the box. It's truly a 10-hour Cub.

Here are the wings straight out of the box. Ailerons are hinged into place but must be glued; the registration numbers have already been applied.

• **Fuselage.** Putting the fuselage together is very easy and takes only about an hour. I had to do some minor trimming to get the fin and horizontal stab aligned properly. The stab in my kit was about ¼ inch wider than the slot it was to be installed in, so I notched the stab's LE to make up for the difference. When properly installed, the stab's TE should be even with the aft end of the fuselage.



Some of the hardware from the kit. The cowl comes already painted, and the lift struts are already covered with Cub Yellow film.



The rudder and fin come already covered and hinged. Simply remove the covering from the area to be glued, slide it into the slot and glue.

SPECIFICATIONS

Name: Piper J-3 Cub

Manufacturer: Hangar 9

Type: sport scale

Wingspan: 80⅛ in.

Weight: 6½ lb.

Wing area: 850 sq. in.

Wing loading: 17.62 oz./sq. ft.

Channels req'd: 4 (aileron, rudder, throttle and elevator)

Radio used: JR 10SX

Engine req'd: .40 to .46 2-stroke; .45 to .60 4-stroke

Engine used: Saito .56 4-stroke

List price: $259.95

Features: the Hangar 9 Cub has all-wood construction, and all the parts are covered with CGM Ultracote. All the control surfaces come with hinge slots already cut and the hinges in place, you simply glue them into place. Hardware includes pushrods, clevises, wooden engine mount, wheels, formed clear plastic windshield and windows, painted fiberglass cowl, aluminum landing gear, fuel tank and control horns. Decals and photo illustrated instructions are also included.

Comments: the Hangar 9 Cub is an easy-to-build sport-scale ARF kit that is very easy to fly. It would make an excellent first choice for someone interested in scale competition. The Cub is one of the best ARF kits I've built, and it can be completely assembled and ready to fly in less than 10 hours.

Hits

- Good quality throughout.
- Lightweight construction.
- Excellent flight performance.
- Painted fiberglass cowl.
- Formed windshield and windows.
- Cub-style wheels.

Misses

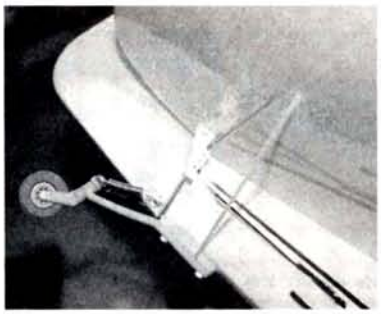
- Rudder ¼ inch too tall.
- Wing hold-down holes in former too big for hold-down dowels supplied.

The Hanger 9 Cub is a natural for conversion to electric power. There's plenty of room for the necessary equipment, and its large size easily carries the weight of electric power. Powered by a geared AstroFlight 40 motor and 21, SR 1800 Max Series cells, this IMAA-legal Cub will give you 10 minutes plus of partial-throttle, scale-like flying.

Converting the Cub to Electric Power

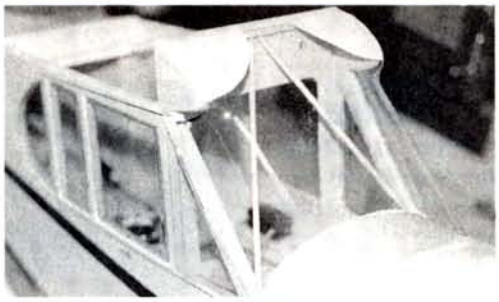
If you'd like to know all the details for the conversion to electric power, contact SR Batteries for a copy of Volume E-14 of their new publication, "Electric Flight Techniques." SR has worked out all the details for modifying the kit and mounting the motor and battery pack. This publication costs only $2, plus $.50 postage. While you're at it, ask them for information on the rest of the "Electric Flight Techniques" series and its companion series, "R/C Techniques." Both versions of "Techniques" are available on a subscription or individual-volume basis. Contact SR, Box 287, Bellport, NY 11713; (516) 286-0079; email: 74167.751@compuserve.com.

When I inserted the fin into its slot, I found the fin was angled slightly to the right and not perfectly vertical. I used a wide wood chisel to remove some of the wood from the block under the slot, and this corrected the misalignment. I then installed the hinges for the elevator halves and rudder and installed the control horns.



A Klett castering tailwheel—a must for the Cub—enhances scale appearance and prevents damage to the rudder on those hard landings.

The aluminum landing gear is simply attached to the fuselage with two bolts and must be covered with Ultracote Plus. Heating the material with an air gun makes it stick to the aluminum very well. Formed wires are also included to replicate the bungie-cord suspension system between the main gear. The overall effect is very scale-like and pleasing to the eye—well worth the effort of assembling the parts.



The windshield is vacuum-formed and fits over the front of the main fuselage former. The trim sheet at the top and bottom of the windshield greatly improves the model's appearance.

FINAL ASSEMBLY

When it was time to mount the wing on the fuselage, I noticed that the holes drilled in the former that accept the wing hold-down dowels were slightly too large for the supplied ¼-inch dowels. Here, you have two ways to remedy the situation. You can replace the dowels with larger 5/16-inch dowels, or you can add plywood patches with ¼-inch holes drilled in them to the former. I chose the latter.

To do this, install the wing, and slide the dowels into the holes in the former. Cut out 3/32-inch-thick plywood patches about 1 inch square, and drill a ¼-inch hole in their centers. Slide the patches over the dowels, and glue the patches into place on the front face of the former. Remove the wing and you're done. Yes, this is best done before the windshield has been glued into place.

The instructions suggest that you add the four wing struts individually and use the metal tabs and screws as illustrated. I wanted a better scale look so I glued the struts together from each side to form V-shaped arrangements. This also eliminates two strut-attachment points in the finished

FLIGHT PERFORMANCE

The Hangar 9 Cub powered by the Saito .56 turning a 13x5 prop is a great combo. I used Byron* 10-percent nitro sport fuel. At the time the test flight was conducted, I had run three tanks of fuel through the engine.

• Takeoff and landing

If you expect the Cub to be demanding on takeoff, forget it. The J-3 is an advance-the-throttle-slowly-and-watch-the-model-take-off-by-itself type of model. With a slight headwind, the Cub was off the ground in about 15 feet, and all I had to do was hold a slight amount of right rudder to keep it tracking straight out. The throttle was at about ¼ when the model broke free of the ground. If you have more than this, you'll have to feed in some down to keep it from climbing at a steep, non-scale angle.

Landing the Hangar 9 Cub is the most fun of the entire flight. The model is so lightly loaded that anything over three clicks above idle will have it overshooting the approach. Set up your approach so the model is about 5 feet above the end of the runway with the throttle pulled all the way back. If you find it does not want to slow down enough to land, go around and pull in a little up-elevator the next time around. I found the most rewarding landings were with about ⅛ throttle while doing a slip. Fun, fun, fun.

• Slow-speed performance

This is where the Cub is most happy—⅛ throttle and some nose-up trim. You can putt around the sky like this all day and use only a smidgen of fuel. The Cub definitely needs coordinated rudder and aileron input to fly properly, and once you get the hang of it, you'll be a happy camper. Pulled into a stall, the nose gets really, really high, and it takes a long time for the model to break. Once it does, it is anticlimactic; the nose lowers a bit, and the wing starts creating lift again. Boring!

• High-speed performance

With anything over ¼ throttle, the model is in its high-speed mode, and a fair amount of down-trim is needed to keep it straight and level. I did try some full throttle runs, and I ran out of down-elevator trim, needing to push the elevator stick forward to keep everything in check. Considering the power and performance of the Saito .56, I'd say that the model would be ideally powered with a Saito .50 Special or equivalent.

• Aerobatics

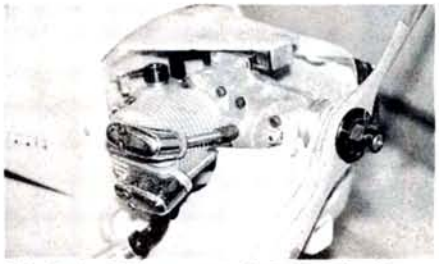
The Cub is not, by any stretch of the imagination, an aerobatic model. It has way too much positive stability for that role. The Cub will, however, do some of the nicest positive-G scale maneuvers you ever saw. Loops look the best when done big and slow and by pulling the engine to idle at the top. Rolls are surprisingly axial for a cabin design, but rudder must be used to keep the maneuver tight. The stall turn is really pretty, especially if you push in some down-elevator on the way down to hold the down line vertical. A little blast of the throttle at the top makes the model yaw over with authority when full rudder is banged in—nice, nice, nice. Inverted flight is possible, but really is not at all comfortable; you are constantly fighting it with rudder and ailerons, so why bother? Snap rolls? How about counting to five before it's rightside up again? Hey, man, it's a Cub! Fly it like a Cub. Use low-rate elevator and high-rate ailerons, and you'll complete the mission—fun!

It is impossible to speak of early aviation and light planes in general without the Piper J-3 Cub entering the conversation at some point. From its very beginnings in the early '30s as the model E-2 Taylor Cub, the plane endeared itself to the general population. In 1935, the Cub's cabin was enclosed, and it began to look more like

The J-3

model. Plastic clevises attach the struts to the model—quick and simple.

For more detail, I added a foot step to the fuselage below the door (I drew the door on with a marking pen), and plastic rigging wire to the tail, and I installed a Klett* castering tailwheel unit. This tailwheel unit requires that you glue an ⅛-inch plywood base to the bottom of the tail so that the unit can be screwed firmly into place. The Klett tailwheel really enhances the Cub's scale appearance. Also, applying some yellow trim sheet to the windshield's base where it is glued to the fuselage makes the windshield installation look much better.



The Saito .56 is a great choice for the Hangar 9 Cub. Notice the split engine cowl installation.

• **Engine and radio.** With its 80-inch wingspan, the Cub is a natural for 4-stroke engine power, and I chose the Saito .56 turning a 13x5 prop. This powerful combination is more than enough for the Cub. The engine fits nicely into the wood-beam engine mount that comes with the kit. By splitting the engine cowl horizontally, I am able to inspect and adjust the engine by removing four small screws without having to remove the propeller. I also installed a Du-Bro* Kwik-Fill fueling valve to simplify filling up the tank. I installed the valve with a metal L-bracket mounted on the firewall and then drilled a hole in the cowl that is aligned with the valve when the cowl is installed. This setup is neat and trouble-free.

The radio for the Cub is a bit of overkill but I really like the JR* 10SX. I used a combination of standard 531 and 517 JR servos for control and Great Planes* Quick Connectors to attach the pushrods to the servos. My only modification to the radio installation was to move the throttle servo to the right side of the fuse. This was necessary because of the position of the throttle arm on the Saito .56. I also used a Sullivan* flex cable for the throttle linkage instead of the solid, music-wire pushrod included in the kit.

Once all the innards are in place and the radio and servos have been checked, you can install the windshield and side windows. I used Pacer* Formula 560 canopy glue. The finished Cub is a really neat-looking, sport-scale model that would be perfect for your first contest; just get some documentation and have fun.

I enjoyed assembling the Cub and think it's a very attractive model, but then again, I told you I have this thing about yellow Cubs. Charge the batteries and get the field box; this Cub's ready to fly!

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

A Second Opinion

When Gerry started building the Horizon Cub, I decided that I just had to build one, too. I'm not really much of an ARF builder, but this one reflects above-average craftsmanship. It's also the case that I recently relocated to Connecticut, and I don't have a shop to work in. Nor do I have most of my tools available. So, the living-room floor served as my workbench for this project, and my drill and Dremel* tool were the only available power tools.

Though not nearly as convenient as the shop I used to live in (so sayeth my wife), it was more than adequate to assemble the Horizon Cub. My aging back disagreed with the floor/workbench idea but a bit of perseverance and a well-engineered kit produced a nice-looking, IMAA-legal airplane that I very much enjoy flying.

The principal difference between my Cub and Gerry's is in the hardware used. I fly mine with a JR 783, and standard 517 JR servos are more than adequate for this lightly loaded plane. I power the model with one of the prettiest engines you ever did see—the Saito .60 twin 4-stroke.

Because of the rear carburetor on the twin and the resultant throttle location, I did have to move the fuel tank to the right of center to allow the linkage to pass on its left side and through the firewall. This was a simple matter of cutting the former that supports the tank so that I could fit the tank snugly about 1½ inches to the right of its normal central location. I glued the tank in place using PFM*. The engine comes with a mount that's bolted to the firewall using four bolts. It took a bit more time because of the two cylinders, but I split the cowl as Gerry describes; it really improves maintenance access.

Though the Saito twin did require some minor modifications to facilitate mounting it in the Cub, the results were worth the effort. This plane and this engine just seem to go together.

— Larry Marshall

PHOTO BY JERRY SMITH

the Cubs we know today. This was the same year that William T. Piper purchased C.G. Taylor's share of the Taylor Aircraft Co., and in 1936, the Cub was completely redesigned and debugged to become the J-2.

A fire destroyed the original factory in 1937, and the entire operation was moved to Lock Haven, PA, where the company was renamed the Piper Aircraft Corp. That year, 687 Cubs were produced. In 1938, refinements to the aircraft led to the famous J-3 version which sold for $1,300, and by year's end, 736 J-3s had been produced. By 1941, sales had increased to 3,197. That year, the Cub went to war and was designated the YO-59. In 1942, a slightly redesigned observation version became the L-4, which was nicknamed the *Grasshopper*.

Today, more than 60 years after its birth, the Piper Cub remains the icon of general aviation. As a collector's item, the much sought-after J-3 has a following among aircraft restorers, and there are rows and rows of restored J-3s at the annual Oshkosh Aviation Expo. Today, as things become more complicated and aircraft become faster and more efficient, it's a really nice treat to just sit back inside a J-3 cabin, grab the control stick and move in a slower, more classic pace.

3D Aerobatics

An introduction to the hottest TOC maneuvers

by MIKE McCONVILLE

3D AEROBATICS. They're not just for helis anymore. In the R/C helicopter world, 3D Aerobatics have been growing in popularity for the past several years. But now, 3D Airplane Aerobatics are here and adding a new dimension in excitement to freestyle aerobatic flight.

ILLUSTRATIONS BY DALE TREECE

WHAT ARE 3D AEROBATICS?

Until now, aerobatic maneuvers were loops, rolls, spins and snap rolls, or a combination of segments of these basic figures. Suddenly things have changed. In a nutshell 3D aerobatics are maneuvers in which the airplane flies in attitudes and moves in directions that are not normal to aircraft flight. The airplane moves in a new or a "third" dimension. When these maneuvers are being performed, one word seems to keep coming up that best describes the show. Awesome!

1. Mike McConville with his sixth-place Giles G-202. Mike, like many other TOC pilots, incorporated 3D aerobatics into his Freestyle flight presentation

Quique Somenzini introduced 3D airplane aerobatics at the 1994 TOC as part of his 4-minute Freestyle routine. After his performance, the onlookers, both spectators and fellow competitors alike, were amazed. At first, what he did seemed almost like magic, as it seemed absolutely impossible to do what he had just done.

THE MANEUVERS

The most amazing 3D maneuvers are ultra flat spins, or horizontal pinwheels, elevators and waterfalls and combinations of the three. Ultra flat spins, or horizontal pinwheels, are flat spins in which the nose is slightly high and there is virtually no downward movement. The airplane seems to "hang" in place and spin like a top around its canopy, as in Figure 1.

The elevator is a maneuver in which the airplane maintains a level or even slightly nose up attitude but descends downward without forward movement. This can be done either upright or inverted, as in Figure 2.

The waterfall is a maneuver in which the airplane stalls from a vertical attitude, the nose falls forward, but as the nose falls to a straight-down position, it quickly snaps through the downward position and back up to a vertical attitude, as in Figure 3.

THE SECRET

After months of tinkering and playing with various setups, I found that most aerobatic designs are capable of these maneuvers. Though this is not for the faint of heart, it does not take a special airfoil, no special superlight wing loading is required, and one need not possess extraordinary flying talent. What it does require are some changes to the control surfaces, a computer radio that will allow flaperon movement of the ailerons, most definitely exponential and dual rates, a great deal of attention to proper control-linkage setup, and the willingness to take some risks and experiment. The amazing thing is that the trick to these maneuvers is in the setup of the model much more than in the moving of the sticks. Basically, once the plane has been set up, these maneuvers are pretty easy to do.

THE SETUP

A lot of control-surface authority is needed, particularly on the elevator. Photo 1 shows my 42-percent Giles G-202 that I designed with 3D aerobatics in mind. I flew this model to seventh place at the 1996 TOC. On some models, it may be necessary to increase the size of the elevators. When this is done, it may be neces-

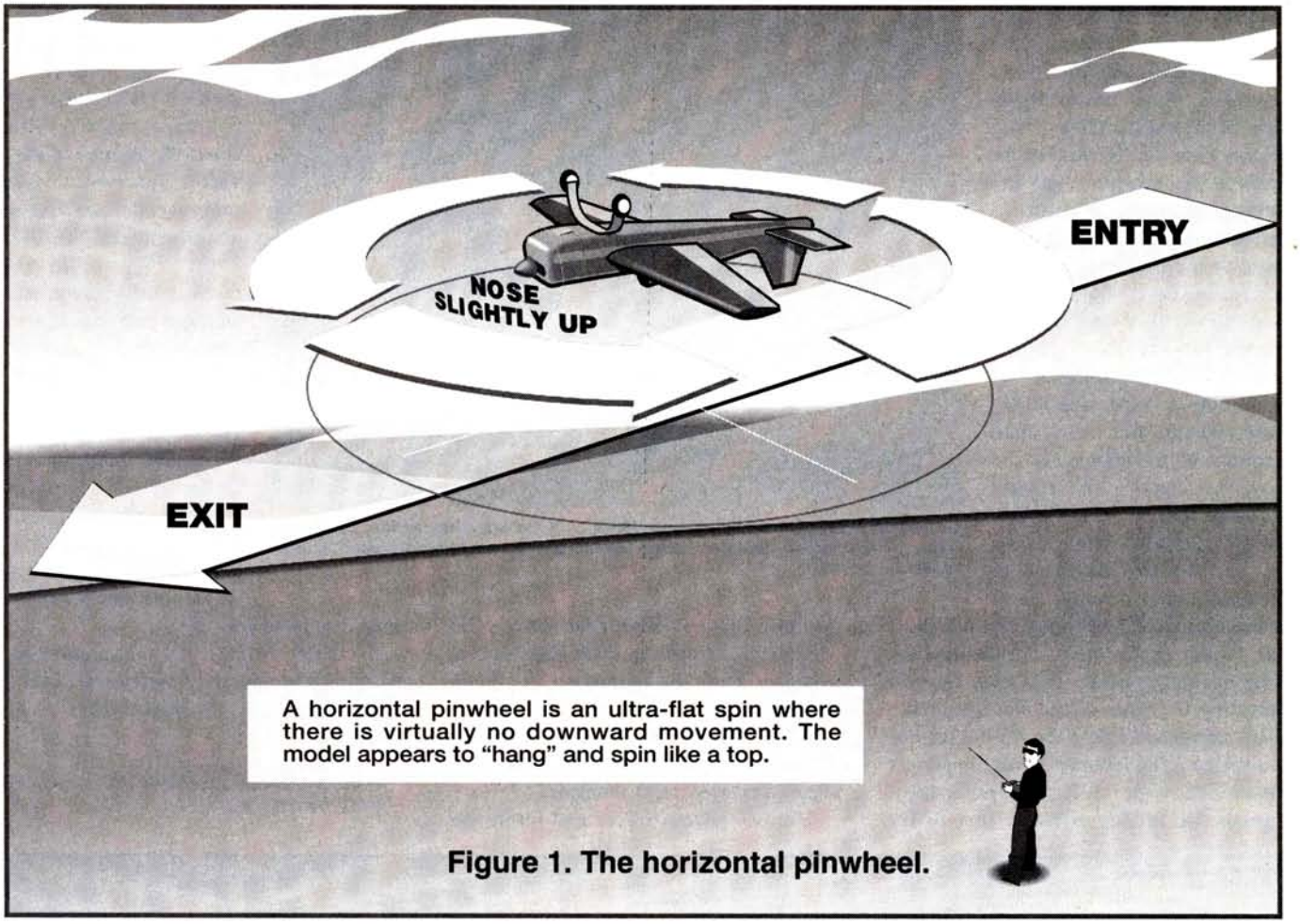


Figure 1. The horizontal pinwheel.

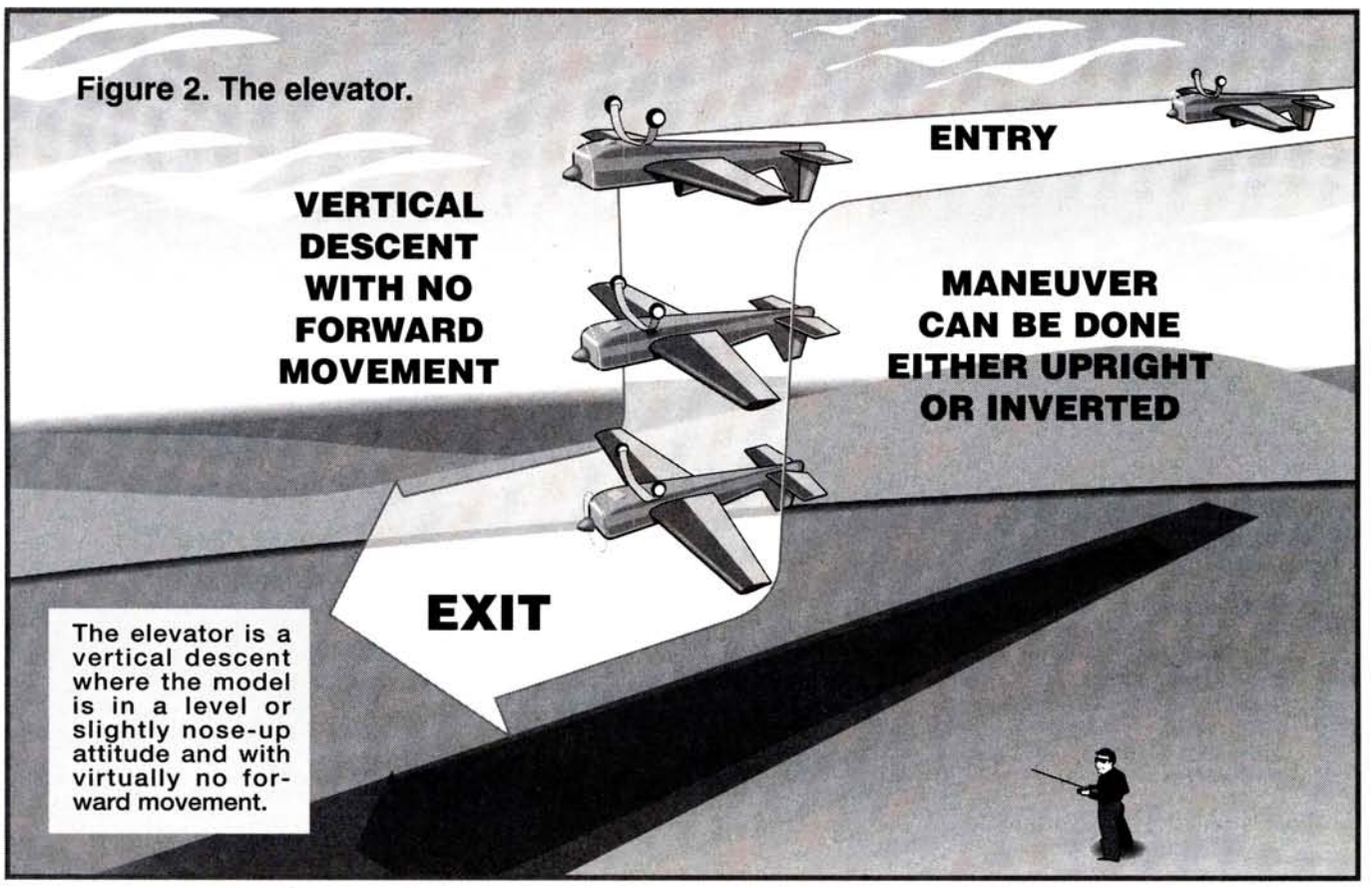
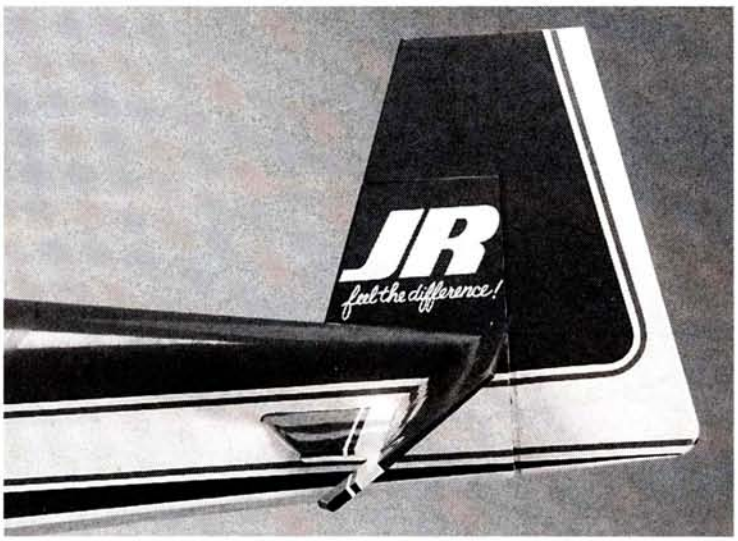


Figure 2. The elevator.

sary to counterbalance the elevators to prevent flutter. Refer to my *Model Airplane News* article on flutter and the methods of prevention (July 1996). Please note that because of the size of the elevators and the amount of movement needed, a great deal of attention must be paid to the linkages to ensure everything is very tight. Photo 2 shows the tail of my Midwest* Extra 3D—an Extra 300S I modified for 3D aerobatics.



2. This 3D Extra (a Modified Midwest Extra 300) has tail surfaces that can move 45 degrees in either direction. Large control throws are a requirement for any model to "go 3D."

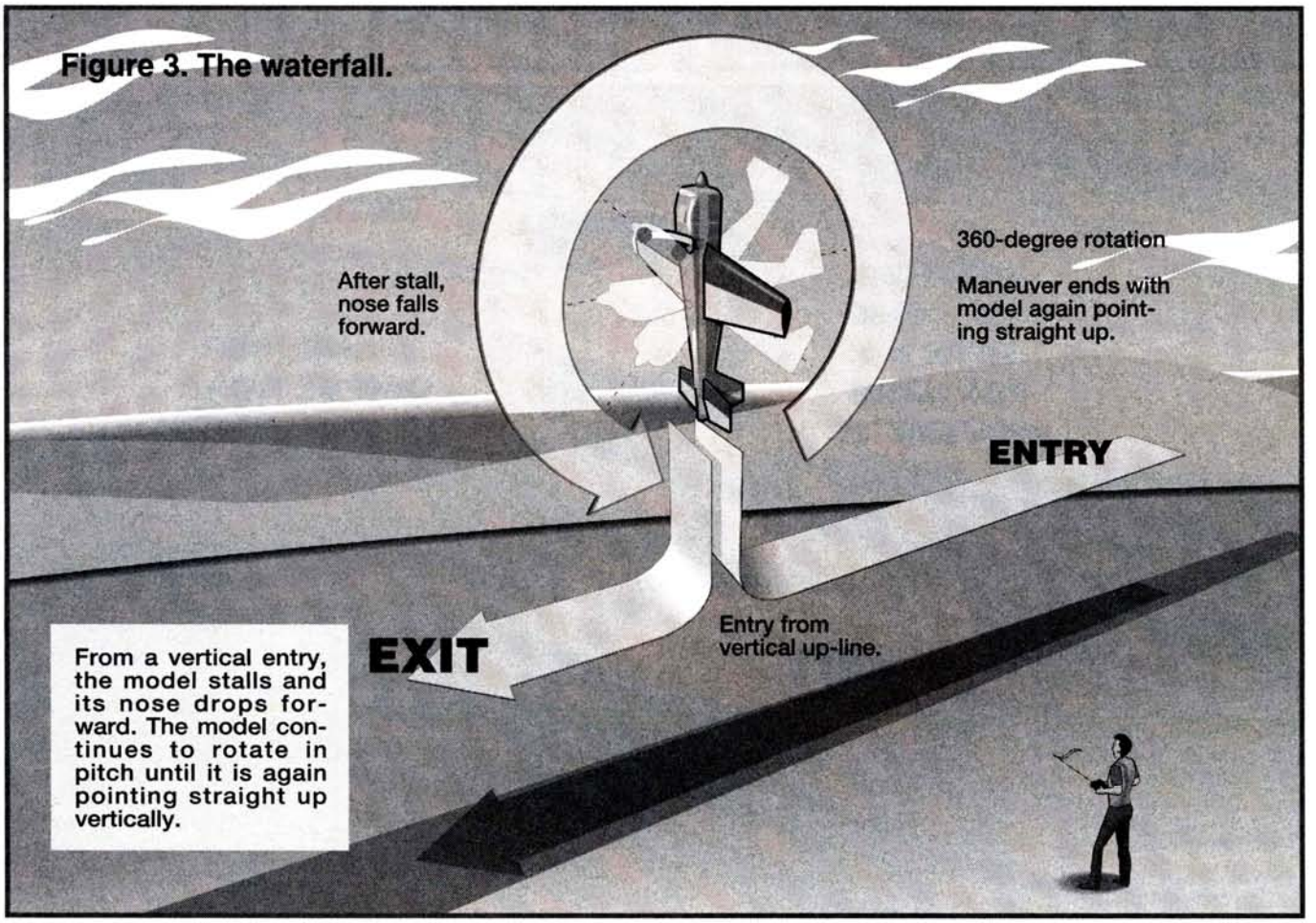
Set up the radio with a low-rate elevator that has a small amount of movement. In the low-rate mode, the model should feel as it normally would. On high rate, or "3D mode," set the elevators to achieve about 45 degrees of movement in each direction, and use about 40 percent exponential to desensitize the feel around neutral. This may require beveling the front of the elevators more than normal to allow the 45 degrees of movement. The low rate is very important because the high rate is so sensitive that it makes the model difficult just to fly around. I flip to high rate for the 3D maneuver and then quickly flip back to low rate after the maneuver has been completed. This is a guideline, as each particular model design will require a slightly different setup, but the elevator is the most important player in 3D aerobatics.

Use two aileron servos and set up the ailerons as coupled flaperons. This will help when doing some of the maneuvers. I start the trimming process with about 30 degrees of elevator movement and increase it each flight until the model goes 3D. Until this point is reached, the airplane acts as you would expect it to when excessive elevator is used: it becomes snappy and tends to tip-stall as elevator is applied. As the elevator movement is increased, it seems to cross a threshold and will affect the model differently. The plane becomes stable and not prone to snap, but rather goes 3D.

In future articles, I'll talk about performing the specific maneuvers. Until then, welcome to the next dimension of aerobatics.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

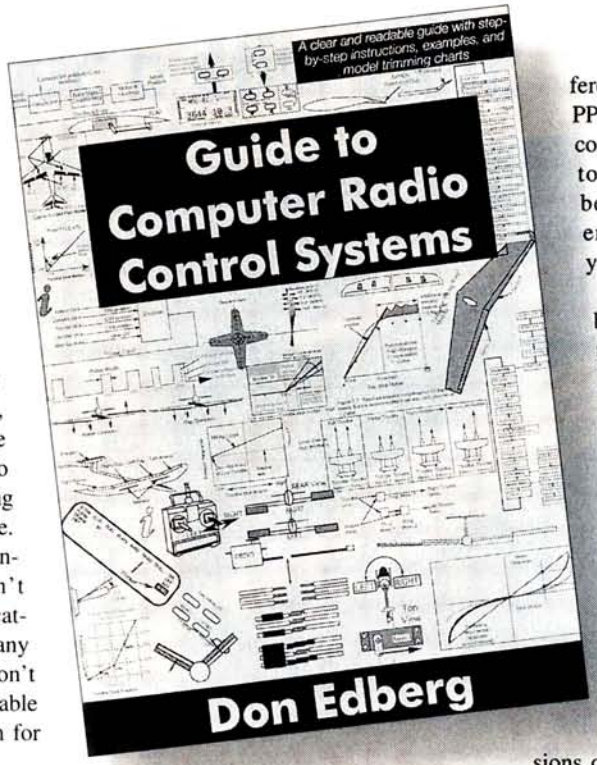
Figure 3. The waterfall.



MODEL AIRPLANE NEWS

PRODUCT REVIEW

Get more from your programmable radio



Guide to Computer Radio Control Systems

by LARRY MARSHALL

PEOPLE who compete in high-level competitions have known the virtues of programmable radios for quite some time. More recently, less expensive programmable systems have been coming to market, and they are becoming quite common on the flightline.

But in spite of all the advantages, many modelers don't embrace these more sophisticated control systems. Also, many who have purchased them don't use most of the features available to them. The principal reason for both of these phenomena is a lack of information.

Learning about anything requires learning how to do something. While a few years ago, programmable-radio user manuals were barely decipherable, they have improved dramatically in the past couple of years, and so they address pretty well this "how" of the learning process. What's lacking, however, is the second component of the learning process. For people to implement knowledge of how to do something, they must also know why they would want to do it and under what circumstances it should be done.

This void has finally been filled by Don Edberg's new book, "Guide to Computer Radio Control Systems." This book emphasizes the "why" of programmable radios, and it does so independently of the brand or model of radio in use. Chapters are structured such that Don explains why you might want to use a particular function, what the logic of its use is and, generally, how you go about setting up the function properly. Then he provides some specifics related to how particular radios handle that function. Unlike most manuals, this is a book that's actually fun to read.

The first two chapters cover topics such as the history of radios, the differences between AM/FM and PPM/PCM and how their radio components work. If you want to know the differences between PPM and PCM encoding, this is a section you'll want to read.

Chapters 3 and 4 cover basic and intermediate functions of computer radios. Here, Don discusses basic things like servo centering, electronic versus mechanical trims, exponential, model naming and throttle cut-off, among other things that will improve your abilities to set up an airplane.

Chapter 5 explains how to set up models with multiple wing servos. Here, you find discussions of flaperons, elevons, elevator->flap mixing and differential. There's also a chart outlining flight tests to properly trim an aircraft.

Programmable mixers and their uses are the topics of Chapter 6. Here, Don discusses the virtues of aileron->rudder coupling, elevator->flap coupling, effecting trim changes when throttle settings are changed, correcting rolling and pitch changes in knife-edge and much more.

The book finishes up with chapters 7 and 8, which deal with programming specific to sailplanes and helicopters respectively. But there are also two appendices on radio-component maintenance and testing that are worth the price of the book by themselves. If you've ever needed to replace servo gear sets or deal with servos that chatter, this is the place to look for advice.

This book really fills a need in our community, and Don has done a very good job of writing in a style that's understandable and fun to read. You can get a copy for $17.95 from Dynamic Modeling, 4922-G Rochelle Ave., Irvine, CA 92604-2941.

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1997. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

EXCELLENT TWIN TAIL

This Jim Messer-designed Ercoupe was built by Jim Killeen of Sebring, FL. The 1/5-scale model weighs nearly 10 pounds and has excellent flight performance on a Zenoah G-23 swinging a 15x10 prop. Jim covered the Ercoupe with house paint over Ceconite.

GOLDEN AGE PURSUIT PLANE

Bob Gerlaugh of Whitwell, TN, built this 1/5-scale P-26 from a Royal kit. He fiberglassed the model and painted the wing with HobbyPoxy and the rest of the model with 21st Century paint. An O.S. 120 4-stroke powers it. Bob says that he took this photo after its first test flight and that the gunsight and flying wires had been removed for flight.

NEVADA GUARDHORSE

Del Coble of Reno, NV, built this P-51 from a Byron kit. It's powered by a gas engine with reduction drive and has a detailed instrument panel, a sliding canopy, retractable tailwheel doors and a BTA autopilot system. Del modeled his Mustang after a friend's full-size plane, which is shown in the photo.

CANADIAN SKYLANE

John Chevalier of LaColle, Quebec, Canada, built this Top Flite Cessna for his friend Curt "Bubba" Beyer of Cocoa, FL. John covered the model with Super Coverite and Randolph butyrate dope to match the light gray, white and green paint scheme of a full-size plane in Saint-Jean, Quebec, where the photo was taken. The model is outfitted with Top Flite's interior kit and has operable landing lights.

GIANT KADET

Built by Mark Sewell (right), this double-size Kadet Senior boasts a 14½-foot wingspan and is powered by a 4500 SuperTigre engine. Mark used 23 rolls of MonoKote on this slow flyer and cut up a lawn chair to make its landing gear.

MILLER TIME

Andy Simmering of Loveland, CO, is shown here with his ⅓-scale Lanier Laser. Andy covered the plane with MonoKote and equipped it with a smoke system in its wingtips. An Air Hobbies 4.2 Sachs engine swinging a Bolly 22x12 prop keeps the 96-inch-span, 22-pound model airborne.

THE WHISTLER

Bill Goldthorpe of Chicago, IL, scratch-built this enlarged Whistler autogyro by enlarging John Kallends plans. Powered by a K&B .45 Sportster engine and controlled with only rudder and elevator, the gyro can hover and make a vertical descent to land. Bill says, "About 10 seconds into the first flight, it was clear how the Whistler got its name; its 60-inch balsa rotor disk makes a very unique whistle."

EXTRA SPECIAL

Jermaine Hale of Lexington, KY, sent this photo of himself and his 33% Lanier Extra 300S. Powered by a Zenoah Z-445, the 103-inch-span, 26-pound model has almost unlimited vertical performance. It's dressed up in 21st Century film with Krylon paint trim and Carden Aircraft decals. Jermaine, who is 14 years old, says that he has been flying R/C for four years and that the Extra—his first giant-scale model—took six months to build, with some help from his dad.

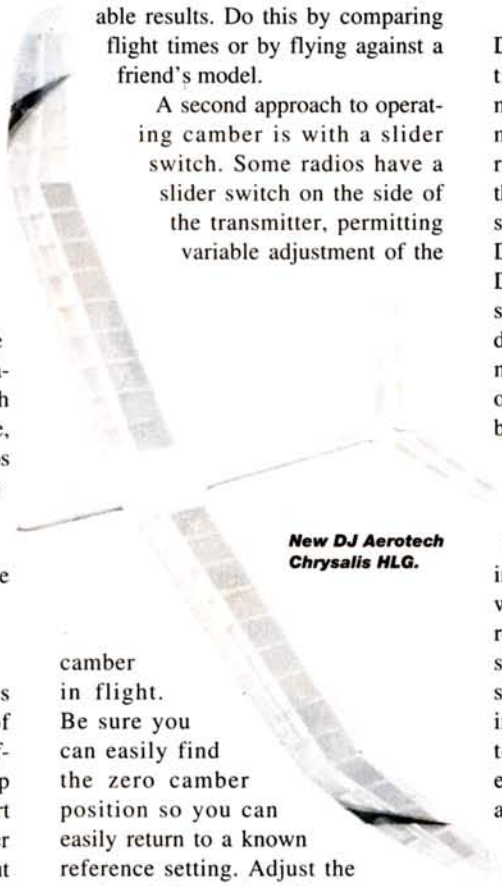
NOT JUST ANOTHER CUB

Lorne Hansen of Vernon, B.C., Canada, took this photo of his Balsa USA J-3 Cub and its J&J Hobbies pilot during the Sandy Point Fall Classic. The model is powered by a 120 flat twin engine with scale exhaust.

by MIKE LACHOWSKI

ADJUSTING CAMBER FOR FLIGHT

GETTING EFFICIENT performance from a glider over a wide speed range is a difficult problem. When flying at a high coefficient of lift (C_L), a more highly cambered airfoil is desirable for low drag. The more cambered sections are capable of higher lift than airfoils with low camber. While at higher flight speeds, a less cambered airfoil is required. No airfoil is ideal for all the flight conditions we experience in R/C soaring. For this reason, many pilots prefer a model with variable wing camber. In the ideal case, the entire trailing edge, both the flaps and ailerons are movable, allowing the pilot to modify the airfoil in flight. Using the flaps alone can also be useful in expanding the performance range of a glider.

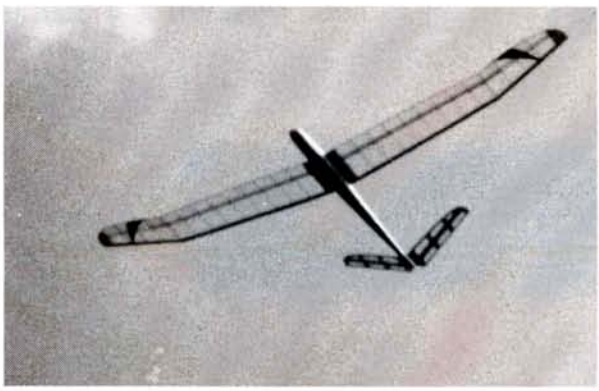


New DJ Aerotech Chrysalis HLG.

CAMBER SWITCHES

Manual operation of camber changes can be accomplished in a variety of ways. How it is done is often the preference of the pilot. The simplest setup is a switched preset. You should start by programming a slow flight camber preset and work from there. Try about 1/8 to 3/16 inch downward travel of the trailing edge for an open-class model. Test the camber preset in early morning conditions when there is little thermal activity. Clicking in the preset should slow down the flight speed of the glider. Hopefully the end result is improved duration when just slowly gliding around the field. Experiment with different settings to get the best flight results. Don't just assume slower is better; look for actual measurable results. Do this by comparing flight times or by flying against a friend's model.

A second approach to operating camber is with a slider switch. Some radios have a slider switch on the side of the transmitter, permitting variable adjustment of the camber in flight. Be sure you can easily find the zero camber position so you can easily return to a known reference setting. Adjust the camber mixing on the slider so your control throws are comparable to what you would use on a switched preset. There is no need to be able to drop the trailing edge 1/2 inch on the slider. The slider provides the added advantage of multiple camber settings. Some pilots like to adjust the camber settings while thermalling based on thermal conditions. Now that you have additional switches or sliders operating on the transmitter, don't forget that they are enabled. Remember to include checking the camber switch or slider in your prelaunch checklist and especially before you re-center any servos. Don't get frustrated readjusting your servos only to find that you had left the camber switched on.



In flight, the Chrysalis is a pretty bird.

WHEN TO USE CAMBER

Deciding when to use the camber takes time and flight experience. The two most common uses will be while thermalling and while flying at a low sink rate when you aren't expecting any thermals or sink. Using camber is pretty simple for most thermal conditions. Drop the trailing edge and climb faster. Don't bother to use extra camber in strong thermals. Extra camber will produce a slower flight speed, and you may find your model being thrown out of the thermal. Reserve the use of camber for softer thermal conditions.

Using camber to maintain a low sink rate takes more judgment. Do I have enough altitude to stay up for the time needed? Would covering more sky make it more likely that I would find a thermal? And you can really hurt yourself by continuing to fly slowly in sink. The extra time flying slowly through the bad air might result in a greater loss of altitude compared to flying at a slightly faster rate to escape the sink before slowing down again. When in doubt, leave out the extra camber.

WHEN LESS IS MORE

There are times when less camber helps the model's performance. By raising the trailing edge, or reflex, the model might fly faster. When you have an airfoil for which reflex is beneficial, it usually takes very little travel—probably less than half the throw you might use for positive camber. Once you can see the trailing edge move, you have enough travel.

Of course, the real question is, does camber changing really help? Didn't the airfoil designer work hard at optimizing the airfoil shape that you now want to change? Separation bubbles are common on our model airfoils, and changing camber can easily make the

problem worse. At a high C_L, separation usually occurs on the top surface, just forward of the flap. Eliminating the drag of the separation bubble is desirable, but building inaccuracies and hinge lines get in the way of achieving this ideal. This is why added camber, which drops the trailing edge, often works for most models.

At high speed, separation bubbles are possible on the bottom surface. Reflex changes the airfoil shape, putting a kink in the airfoil surface. The location of this kink is in the area where separation is possible, and it increases the likelihood of separation from the bottom surface. Just when you thought you had a low-drag model, drag from the separation bubble hurts the model's performance. Most thermal airfoils don't benefit from reflex, especially airfoils that already have camber under 2.5 percent. Older, more highly cambered sections are more likely to respond positively to using reflex.

SPORT H/L GLIDERS

I really enjoy flying hand-launch gliders, and I currently have several Monarch variations I fly in competition. For most competition pilots, the cost of the pre-sheeted wings and carbon-reinforced fiberglass fuselage is all part of flying with the best equipment we can field. Unfortunately for the sport flyer, these models might be considered too expensive. Where do you find a low-cost model with the computer-optimized aerodynamics and structures of a model like the Monarch? How about from the same designers?

Inspired by a discussion on the Radio Controlled Soaring Exchange (RCSE) about the shortage of low-cost, entry-level HLGs with good performance, DJ Aerotech* has released the Chrysalis. It features simple, all-wood construction and can hold a standard receiver and servos to keep total cost down. The wing is not sheeted, but DJ Aerotech provides laser-cut ribs shaped to correct for covering sag, producing a more consistent airfoil than you normally get with an open-frame structure. Performance is optimized for light-air conditions with plenty of stability and handling designed with the new HLG pilot in mind. Be sure to check out their Web page at http://www.bright.net/~djwerks/.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

Golden AGE OF R/C

by HAL deBOLT

WORLD-CHAMP RACING

TO BEGIN, we need to complete the history of pylon racing. Last month, we ended with FAI pylon racing. I mentioned that I was the chairman of the FAI R/C Racing Committee and that our objective was to create a category that would attract enough interest to bring pylon racing to world-championship status.

A member of the Canadian FAI team returns from a successful heat at AMA's Lakehurst "Aerolympics."

SETTING THE STAGE

The FAI pylon-racing category of the time had been tailored to the whims of overseas countries, but it had not created sufficient interest. The U.S. had by far the greatest racing activity worldwide; however, there was great apathy toward FAI pylon, and very few Americans participated. Americans seemed to prefer the Formula I style and size of racers. If the U.S. could be drawn into the FAI activity, we thought that the desired participation could be achieved. Remember, the rest of the world frowned on our Form I "hotrods"!

I wish I could recall the committee members' names (they devoted much time and effort to the project), but details from 20 years ago escape me. However, five countries were represented on the committee. Most prominent were Australia, England and France. As chairman, I first asked for opinions and suggestions from each. The replies were as diverse as could be! One felt that something similar to "Quickie 500" would do, another thought that the status quo was fine, and Australia had developed a category of their own. No one suggested Form I style, which seemed to be the only way to get the U.S. more deeply involved. Would you believe it took about two years of constant negotiations before the current FAI rules were accepted?

The 1972 Nats qualified the American FAI team. Telford and Violett were no. 1.

When it appeared that none of the suggestions would expand American interest, we formulated a set of regulations that would allow Form I models, but not engines, to be used. The initial reaction to this was cool; remember, at first, it was "No way!" When further negotiations changed the scale requirements from modeling Formula I racers to modeling any full-scale aircraft that has raced, the mood changed and the regulations were finalized. Now it seemed that the Americans

OLD BIRDS OVER PENNSYLVANIA

The Society of Antique Modelers (SAM) keeps old-time models alive throughout this country and even the world. While the majority of their competitions are basic, on occasion, they have visionary events such as a commemorative "Kords Wakefield" and, recently, a Simmers "Gollywock." It's amazing how well-attended these very specialized events have been!

Any accomplished modeler recognizes that Bill Brown brought engine power to the multitudes and that Maxwell Bassett showed us the worth of engines by dominating Nats free-flight events in the early '30s. Working together in their late high school years, Bill solved the engine mysteries while Maxwell developed the model to use the power. It's hard to believe these two could have envisioned what gas power has done for model aviation, making R/C possible along the way.

Now the SAM "Second Chance Squadron" and the "Cocalico Prop Busters" have conceived a commemorative event to honor these two pioneers. It will be held June 28 and 29, 1997, at the club field in the Lancaster, PA, area.

This is a major effort by this group, and the competition will use replicas of Bassett's "Miss Philly," that first gas model. The entries are divided into six classes of this model: giant scale, Brown powered, spark ignition, glow-plug ignition, electric power and ½A Texaco. With most of the events, any size "Miss Philly" is eligible, so it appears only one model will be required to enter several categories. All are R/C-assist.

An extensive effort has been made with the details of this commemorative, and they are available from contest director John Delagrange at 1822 Longview Dr., Lancaster, PA 17601. Please include an SASE. Good luck!

Left: early FAI racers offered unique features such as the unusual muffler and "mono-wheel" gear on the "T-V" racer. Right: Ed Shipe's dedication in the '60s led to the NMPRA success, which is evident these decades later.

had no excuse *not* to participate. From my viewpoint, as chairman, it is truly amazing what diplomacy can achieve and how modelers worldwide can be brought together. The committee deserves accolades!

As a result, the FAI granted R/C pylon racing world-championship status, with Australia hosting the first event. The American team dominated the competition; this further increased interest in the USA.

Hal deBolt's combo FAI/Formula II P-51 racer (K&B powered) is prepared for its winning Nats race.

R/C pylon history continues today with the NMPRA guiding the way. Currently the future appears a bit clouded. While the "sport racing" categories maintain excellent participation, Formula I is stagnant. Formula I could be compared to the "Reno Unlimiteds" with the necessary experience, complexity and expense reaching close to the ultimate, it seems. However, concentration can bring you to the élite of racing. It truly is great flying!

Surely, every racing heat is a new experience. How about sharing some of those moments with us?

THE MAGIC MUFFLER

Of further interest: one country in which FAI pylon racing flourished was Australia; they brought early FAI pylon to a pinnacle no one else achieved. At a high point in their activity, Rayjet Phelan set an FAI pylon record of 1:15, which was comparable to our Form I record—even though the FAI model was one third larger! How was it done? FAI rules required a muffler, and the Aussies used that seeming handicap to their advantage.

The trick was the "Magic Muffler." (Those interested in complete details can see the April 1980 issue of *Model Airplane News*.) To achieve those high speeds, a lot of experimenting and development was required. Tom McCaughey and his associates spent five years investigating a means to attain the required dB level while also increasing power. You could say that the result was an effective muffler-supercharger. Their test readings were impressive: a 3,000 to 4,000 increase in static rpm plus unloading another 6,000 in the air. In flight, rpm was in the 32,000 range! No wonder race times were so low!

In short, the Magic Muffler is the tuned-pipe concept shrunk to normal muffler size. The muffler consists of an outer shell that's tapered at the outlet end with a small exhaust tube, and an inner pipe that was sized to suit the rpm and acoustics. The chamber between the inner pipe and outer shell is a resonator that's tuned to the engine's acoustics. The engine exhaust exits through the inner tube and is reflected back into the cylinder by the angle of the outer shell's tapered cone. This creates an action similar to that of a tuned pipe.

The combo of the two effects creates considerable supercharging while keeping engine noise below the required level. Talk about having your cake and eating it, too! My curious, non-scientific test of the first Magic Muffler showed a 2,000rpm gain—truly amazing!

And so it was. Remember, this is your OT R/C place.

JIMMY GREER—A GENTLEMAN'S GENTLEMAN

The OT generation keeps shrinking. We recently lost a fine advocate of model aviation and great modeler/flyer: Jimmy Greer left us after only 60 years. Anyone who traveled the "pattern circuit" in the '60s and '70s will recall this gentleman's gentleman and how his low-key, lighthearted approach added much to those events. Jimmy and I became very good friends, and his good-natured gibes were a tickler.

James Greer was the ultimate example of the American Dream. Early on, he found employment in an abrasives facility, worked diligently and learned how abrasives were produced. He saved enough to open his own abrasives factory and put an all-out effort into it. Greer Abrasive became a resounding success. Jimmy's life was an excellent example of what determination can do.

I will surely miss him, as will his many friends across the nation. God speed, ole buddy!

Hal deBolt and Jimmy Greer at the '67 "Wright Brothers Memorial" meet. Jimmy holds Hal's "Cobra." Hal said it really needed a decent pilot!

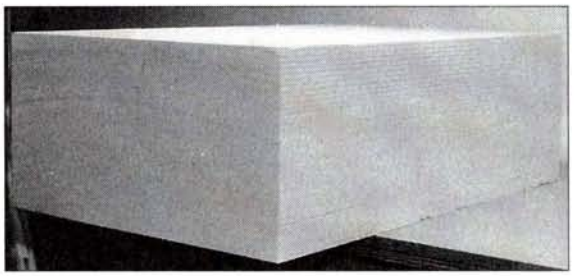
MODEL AIRPLANE NEWS

HOW TO

Make and use a foam lathe

Jim Ryan's club is building a 12-foot B-29 Superfortress with an R/C X-1 in its belly. Here's how he formed the cylindrical parts for the project.

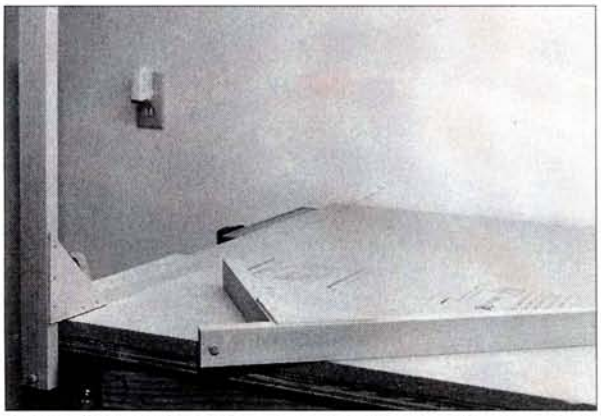
Foam-Cutting Techniques



1 *Here's the form in which the foam is purchased. These blocks are cut to order from huge billets, so nearly any size airframe is possible. This block was 12x24x48 inches and cost under $30.*

by JIM RYAN

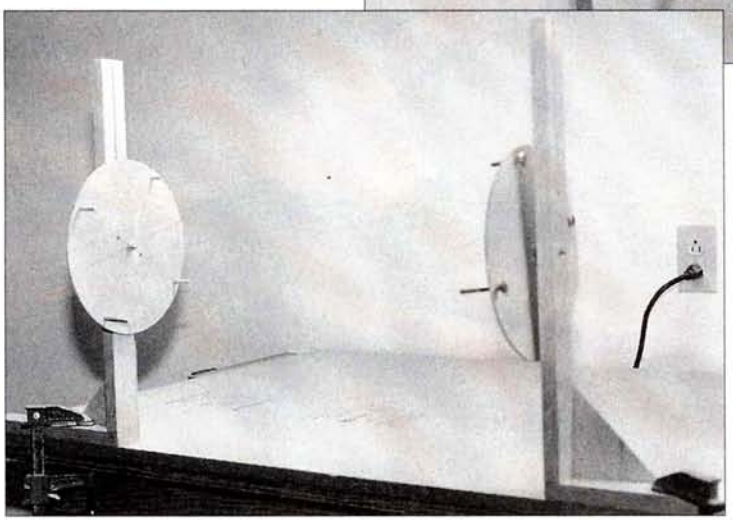
EXPANDED POLYSTYRENE FOAM is one of the most versatile and least expensive materials available for building model aircraft. It's light, easy to shape and has high compression resistance. When covered with balsa sheeting, fiberglass or other composite material, it's very strong. Most experienced modelers are familiar with sheeted foam wings, but foam also offers advantages for building fuselages and nacelles.



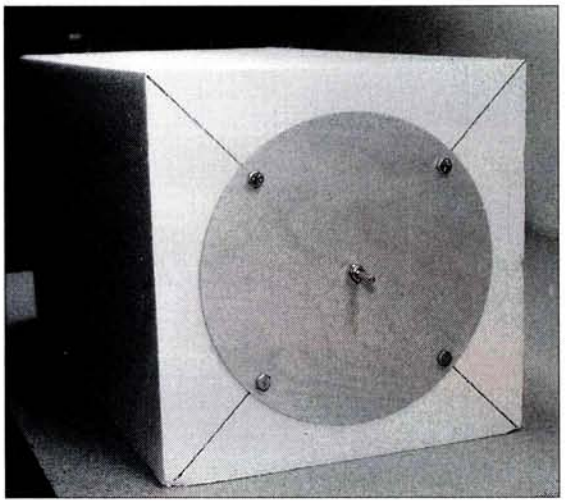
2 *You first need to cut the correct size foam block for your work piece. The best way to do this is to make a set of uprights that can be clamped to your workbench to act as cutting guides. Those shown are made from 1x2-inch stock with a plywood gusset. Note that the tailpieces of the uprights extend below the bench top to provide a lead-out for the wire as it exits the foam. Also note the stop pegs that prevent the wire from running off the ends of the tailpieces.*

PHOTOS BY MARK FEIST

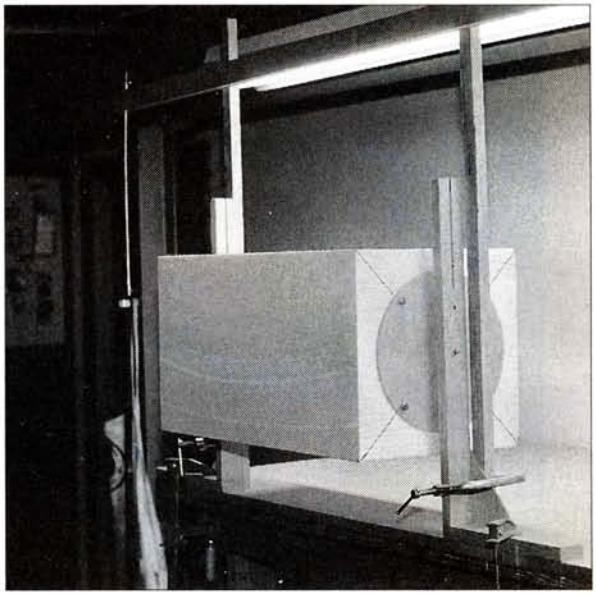
3 *In practice, the uprights are clamped to the bench, the foam extends out between them, and the hot-wire bow is used to slice off a block of the desired size. The block being cut is 12x12x24 inches.*



4 *Here are the parts of the lathe. The lathe uprights are simple to build from 1x2-inch stock, and a custom set of templates can be quickly produced for each project. The pivot holes allow the work piece to rotate freely, and the saw kerf (wire guide slot) keeps the hot wire parallel to the axis.*



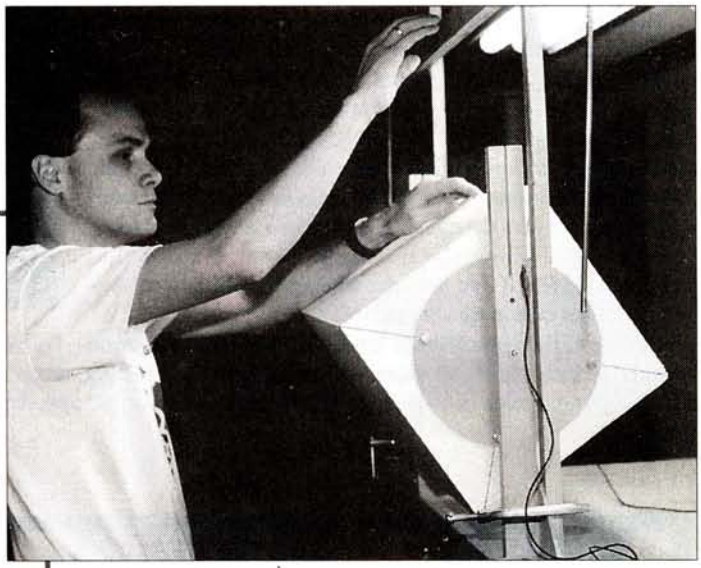
5 *The templates are pegged to the ends of the block of foam with bolts. The center bolt is a pivot. The templates could be tack-glued to the foam block if you prefer. The peg holes are bored into each end of the block with a piece of sharpened 1/4-inch brass tube. If you clean the plug out of the tube after making each hole, this makes a much cleaner hole than a regular drill bit.*



6 *After the templates have been attached, the assembly is mounted between the centers in the lathe uprights, which are simply clamped to the workbench at the proper spacing. The work piece should pivot freely. The extended uprights shown here help to support the frame of the cutting bow, but they aren't absolutely necessary.*

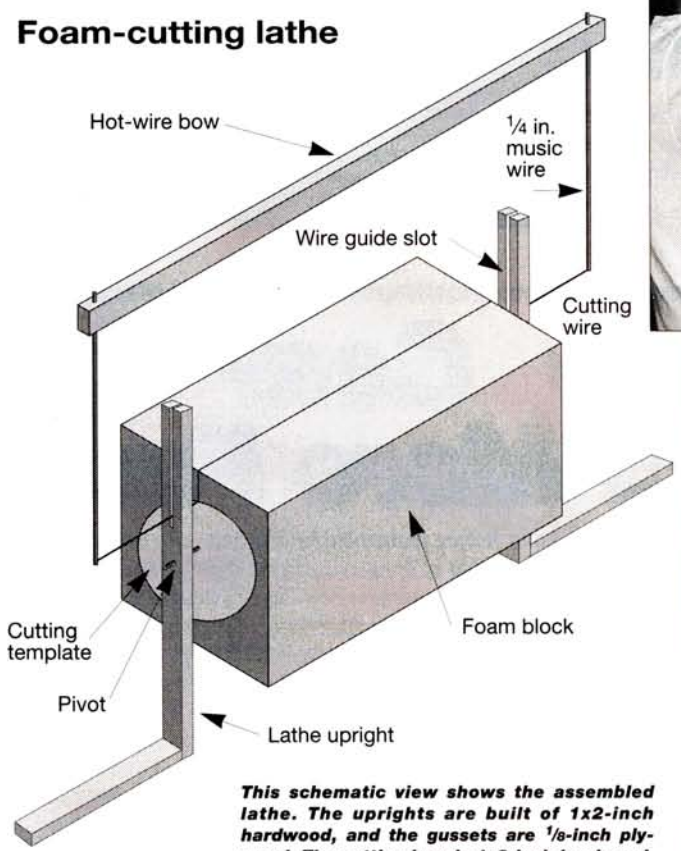
When a friend of mine and I embarked on the construction of a 12-foot-span B-29, we decided to build the entire airframe of foam and fiberglass to save both cost and weight. Since the fuselage of the Superfort is cylindrical with a long conical tail, we needed a way to produce these parts accurately. I settled on building a "foam lathe" that would hold a block of foam between two center bolts so that I could use a hot-wire bow to cut the part to shape.

With this lathe, producing accurate cylindrical and conical foam sections becomes a one-man job. With a second set of hands, cutting elliptical and more complex cross-sections is also possible. Since first building the lathe for the B-29, I've used it on several other projects. It's a time-saver.

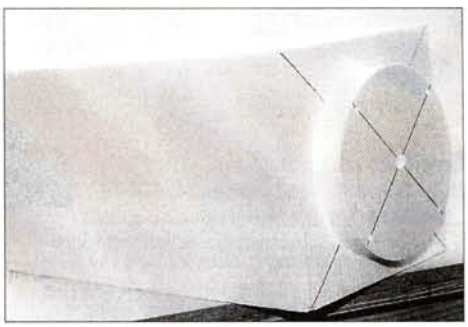


7 *The hot wire of the bow is dropped down through the wire guide slot in the uprights. Allow the wire to sink into the foam until it contacts the templates, and then begin slowly turning the block. Allow the wire to take its time, as you don't want it dragging behind in an arc; the key to a smooth finished product is to keep the rate of rotation as smooth and constant as possible without forcing the wire. When the wire completes the cut around the work piece, either lift the bow out of the work piece immediately or simply turn off the power supply so that the wire cools. Allowing the hot wire to stay in contact with the work piece will leave a groove that you'll have to fill.*

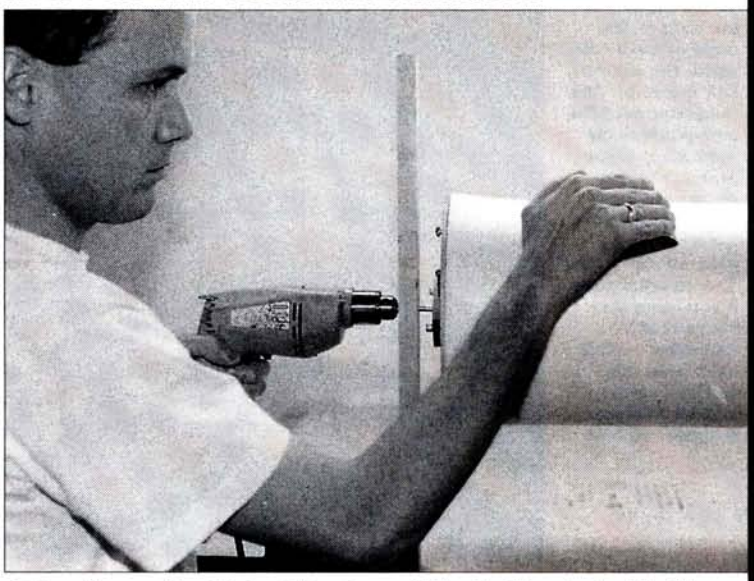
Foam-cutting lathe



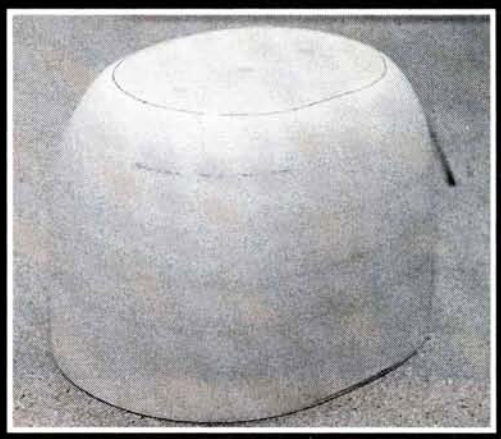
This schematic view shows the assembled lathe. The uprights are built of 1x2-inch hardwood, and the gussets are 1/8-inch plywood. The cutting bow is 1x2-inch hardwood, with 1/4-inch music wire for the arms.



8 *You can now remove the work piece from the lathe and slide it out of the block. The quality of the cut will be far beyond anything you could do by hand.*



9 *To get a smoother finish quickly, clamp a "lathe dog" to a steel rod that is inserted into the work piece. Then use a variable speed drill to spin the cylinder slowly, and lightly sand it smooth. If the center holes weren't drilled quite straight into the block, the work piece may tend to wobble slightly, but if you keep the rpm low, this won't be much of a problem.*



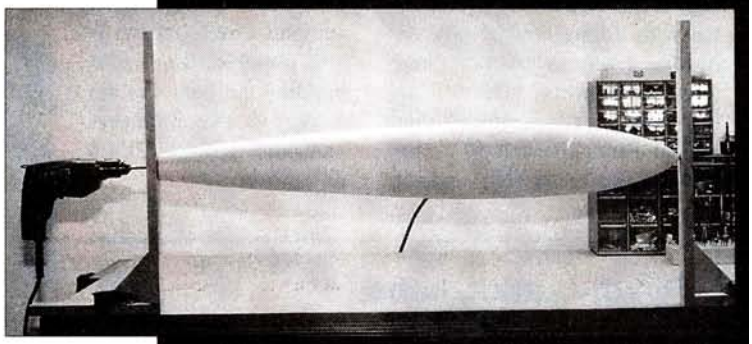
10 *The lathe is even handy for roughing out parts that have an elliptical cross-section. This cowl plug started out as an elliptical cylinder that was then sanded to final shape.*

The photos that show how the lathe is assembled and used are self-explanatory, but here are some additional tips.

After you've finished the exterior surface of the cylinder or cone, it can be hollowed out to reduce weight by attaching female templates for the interior surface and using a hot wire to make the cut. To avoid slitting the outer surface, you should bore a hole completely through the cylinder in the waste area and fish the hot wire through, just as you'd do with a scroll saw.

For elliptical or irregular sections, it's easier to follow the template contours if you hold the wire against the *side* of the upright, rather than in the wire guide slot.

The use of this lathe is really limited only by your imagination. For very light models, you can finish the foam with low-temp film covering, or for heavier models, you can cover it with balsa, obechi, fiberglass, Kevlar, or carbon fiber. Good luck!



11 *Because you can mount a variable-speed drill on the lathe to spin parts, this X-1 fuselage was made by cutting blocks into conic sections and then mounting them on a rod so that I could sand them to shape. This male plug will then be covered with fiberglass.*

U.S. Scale Masters CHAMPIONSHIPS

by JERRY NELSON

THE SCALE MASTERS is the most prestigious scale competition in the U.S. The 1996 championships were held in Mesa, AZ, on October 31 through November 3, 1996, and the collection of modelers and models was truly Masters' class. All competitors have to earn the right, or qualify, to participate. One is not invited, nor does one simply pay an entry fee and compete. About 20 regional competitions are held throughout the U.S. during spring through fall, and one has to place at least in the top 30 percent in at least one of the regional qualifiers to earn the opportunity to compete at that year's championships. About 50 pilots entered this year's championships. Many others qualified but did not compete. In actuality, the contestant, not the aircraft, qualifies for the championships. The aircraft flown in the qualifiers doesn't have to be the aircraft flown in the championships.

The great scale shootout in Mesa, AZ

Hal Parenti of Chicago, IL, entered his own design—the Ryan Fireball. Perhaps the most complex aircraft entered, it had a ducted-fan powerplant and a Saito 300 4-stroke twin for power. His static score of 96.50 made his aircraft a potential winner, but during one flight, the Saito quit for unknown reasons just at the wrong place, and the aircraft was totaled; 45th place.

Garland Hamilton's first-place winner—a Lockheed DT-33A—comes in for another perfect landing. Built from a BMV kit, the model is powered by a turbine.

The U.S. Scale Masters organization has its own set of rules and procedures within the safety parameters of the AMA. There are many behind-the-scene workers, but Harris Lee and Kent Walters are the two most visible forces within the steering organization. The 1996 rules are the result of 16 Scale Masters competitions, and the rules and procedures have been sufficient to select the best R/C scale modeler in the USA.

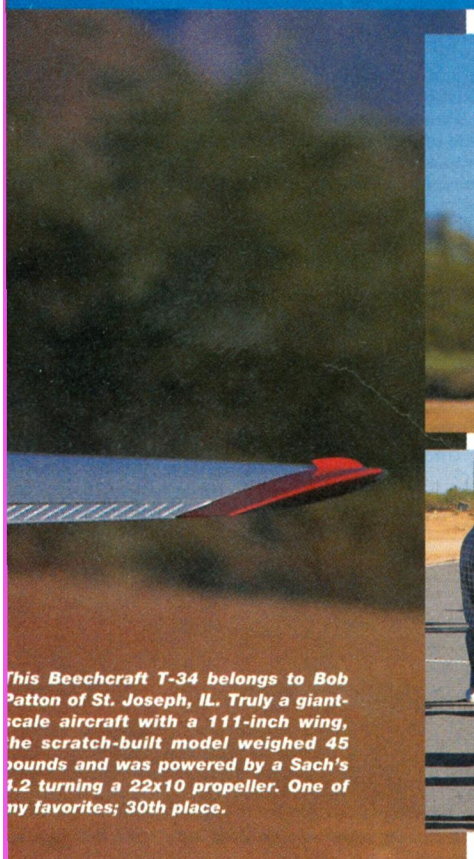
Credit must be given to the many sponsors within the hobby industry who have given this competition financial support for many years. Pacer Technology* (Zap) is a key sponsor. Without Pacer and the other sponsors there wouldn't be a Scale Masters Championships.

Nick Ziroli Jr.'s beautiful Grumman TBM Avenger flies on to its sixth win. Nick also earned the high static score.

MASTERS AIRCRAFT

The aircraft chosen by the entrants are varied. There is no particular trend; however, in this writer's opinion, only a few aircraft types are likely to produce a championship model. Anyway, in the top 20, there were three turbine/fan jets, six propeller-driven warbirds, one crop-duster, three Golden Age aircraft, three civilian aircraft and four WW I aircraft. Of the top 20, two were twins—truly spectacular assortment of aircraft.

Charlie Nelson of Berlin, MA, flew his own design—a Waco VKS 7F. Scale—2.8 inches per foot; wingspan—93 inches; length—62 inches; Seidel 7-cylinder radial engine; Airtronics Stylus radio with 10 servos; 15th place.



This Beechcraft T-34 belongs to Bob Patton of St. Joseph, IL. Truly a giant-scale aircraft with a 111-inch wing, the scratch-built model weighed 45 pounds and was powered by a Sach's 4.2 turning a 22x10 propeller. One of my favorites; 30th place.

The competition consists of two parts—static judging and flying. The static score is added to the average of the best three flight scores. There are separate categories for propeller-driven and jet aircraft. A grand champion is selected, based on the highest score, regardless of class. In addition there are the highly coveted Pilots' Choice award and

Dick Hansen of Portland, OR, has been flying his Proctor Albatros in scale competitions for eight years. Powered by an Enya VT240 V-Twin, the model weighs 22 pounds. A master at making WW I aircraft look very realistic in the air, Dick placed 23rd.

Above: Mike Winter of Sarasota, FL, built this 1/3-scale Sopwith Pup from a highly modified Balsa USA kit. Weighing 50 pounds and powered with a Sachs 4.2 turning a 24x10 Zinger propeller, the model has a complete scale pull/pull cable system for all controls; 10th place.

Below: Larry Sutherland's Proctor S.E.5a is fully detailed with rib stitching and side panel lacing; 31st place.

This Aero Commander twin was scratch-built by Bob Francis of Aptos, CA. His own design, the model uses an Airtronics radio and is powered by two Zenoah G-38 engines. Bob made his own molds for the fuselage and nacelles; 18th place.

Randy Hansen of Astoria, OR, scratch-built this Cessna A-188 Agwagon from New Zealand Aero Products plans. Winner of the Pilots' Choice award, his model featured scale crop-dusting powder. Randy made all the scale detail items; wingspan—128 inches; power—Zenoah G-62; 4th place.

James Hiller of Spokane, WA, designed and scratch-built this 1/5-scale, 80-inch-span de Havilland DHC-1 Chipmunk; O.S. 120 4-stroke engine turning a 16x8 Master Airscrew propeller; Futaba 7UAF with 8 servos; covered with CGM Ultracote; 34th place.

Left: Dave Lovitt placed 13th with this Northrop Gamma. Right: Gary Parker of Santa Rosa, CA, built this 22-pound, 1/4-scale Albatros from a Proctor kit. It's powered by an Enya VT240 twin, and the scale detail is excellent; 14th place.

awards for Top Static, Best Civilian and Best Military.

Static judging was done at nearby Champlin Fighter Museum—an excellent setting for the evaluation of the models. The models are judged for quality of craftsmanship, accuracy of outline and color and markings. A very complete judging guide, created by the Scale Masters Committee, is used to provide a fair evaluation of the models' accuracy. Many of the static judges are the same each year. A top score of 100 points is possible. The score each contestant receives is not posted until after the first round of flying.

What kind of aircraft gets the best static score? Over half in the top 10 were WW I fighter aircraft (seven out of 12; there were two ties). Perhaps it is easier to duplicate their scale details since

(continued on page 53)

SCALE MASTERS WINNERS

Place	Pilot	Model	Static Score	Flight Score	Total Score
1	Garland Hamilton	Lockheed DT-33A	99.00	93.66	192.66
2	Shailesh Patel	F-4 Phantom Jet	98.00	91.16	189.16
3	Eugene Job	Hawker Sea Fury	96.00	91.41	187.41
4	Randy Hansen	Cessna A-188	97.50	87.41	184.91
5	David Ribbe	F-16C Falcon	96.00	88.83	184.83
6	Nick Ziroli Jr.	TBM Avenger	99.50	84.83	184.33
7	John Cole	DH-1A Pusher	98.00	86.16	184.16
8	Brian O'Meara	Hawker Sea Fury	95.00	89.08	184.08
9	Wayne Knight	C-47	93.00	90.66	183.66
10	Mike Winter	Sopwith Pup	96.50	86.83	183.33
11	Joe Topper	Nieuport 28	96.50	85.41	181.91
12	Chuck Fuller	Waco Taperwing	96.00	85.58	181.58
13	Dave Lovitt	Northrop Gamma	96.50	84.66	181.16
14	Gary Parker	Albatros DVa	99.00	81.25	180.25
15	Charlie Nelson	Waco Cabin	95.00	85.16	180.16
16	Albert Kretz	Dornier Do 23G	95.00	85.00	180.00
17	Jeremy Fursman	Spitfire PR 19	95.00	84.91	179.91
18	Bob Francis	Aero Commander	94.00	85.58	179.58
19	Ernest Harwood	S.E.5a	99.00	79.91	178.91
20	Skip Mast	Piper J-3 Cub	93.00	85.83	178.83

An unusual subject, this Dornier Do 2236 twin was built by Albert Kretz. The relatively small aircraft flew quite well; 16th place.

Joe Topper of Clackamas, OR, built this 1/4-scale Nieuport 28-C1 from a Proctor kit. Weighing 20 pounds, the 80-inch-wingspan model is powered by a Siedel 7-cylinder radial engine; 11th place.

Doug Crumley's Stinson L-5 built from Vailly Aviation plans sports an attractive desert-camo paint scheme; 21st place.

Shailesh Patel of Eureka, CA, entered this F-4 Phantom built from a BVM kit. Powered by two BVM fan units, this awesome 40-pound aircraft flew magnificently. Inside, the aircraft looked just like a full-scale jet with pipes, tubing and all kinds of stuff buried in every nook and cranny; 2nd place.

(continued from page 51)

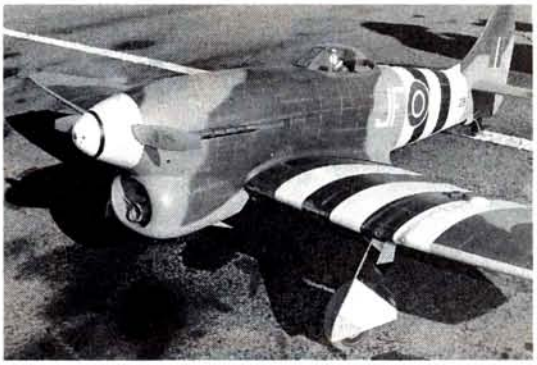
many of the full-scale aircraft were rather small compared with most latter-day military aircraft.

Propeller class winners
1. Eugene Job, Hawker Sea Fury
2. Randy Hansen, Cessna A-188 Agwagon
3. Nick Ziroli Jr., TBM Avenger
4. John Cole, de Havilland DH-1A
5. Brian O'Meara, Hawker Sea Fury

Jet class winners
1. Garland Hamilton, Lockheed DT-33B
2. Shailesh Patel, F-4 Phantom
3. David Ribbe, F16C
4. Jerry Ortega, T-33

Pilots' Choice: Randy Hansen, Cessna A-188 Agwagon
Top Static: Nick Ziroli Jr., TBM Avenger (99.5)
Best Civilian: Randy Hansen, Cessna A-188 Agwagon
Best Military: Nick Ziroli Jr., TBM Avenger

The other part of the competition was the flying portion. During the next three days of flying, five rounds were flown. The weather conditions varied quite a bit. Crosswinds on the second day were a serious problem for many of the tail-dragger aircraft. Obvious exceptions were the three Hawker Sea Furys. Generally, they all made excellent takeoff, regardless of the wind conditions. Their wide-stance landing gear were obviously an asset.



Greg Singleton's Hawker Tempest V; 26th place. Nicely executed.

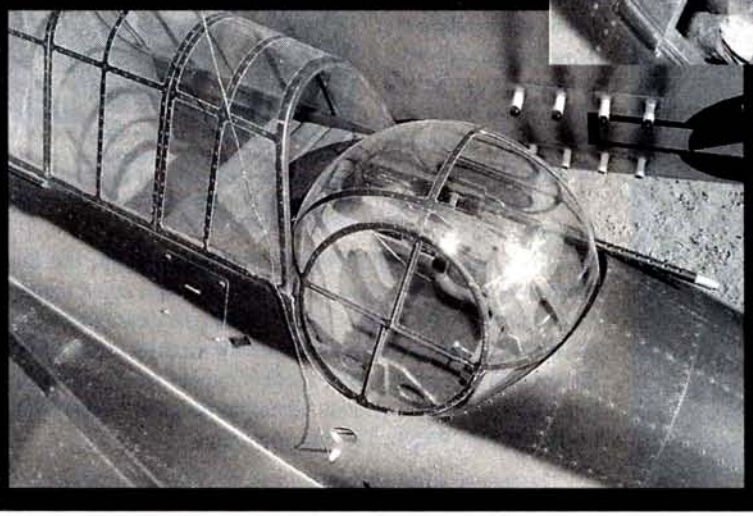
It is interesting to note that 40 of the 49 aircraft flown were tail-draggers. One would think that for best takeoff points an aircraft equipped with tricycle landing gear would be desirable. The Scale Masters rules don't require that the takeoffs or landings be judged maneuvers. This is an excellent rule because it allows tail-draggers to be competitive against trikes.

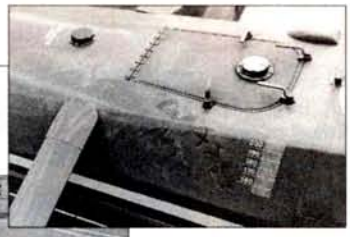
There is a noticeable trend that favors jet aircraft. Three out of the top six aircraft were jets, and only four jets entered. When

HALF A POINT FROM PERFECT!

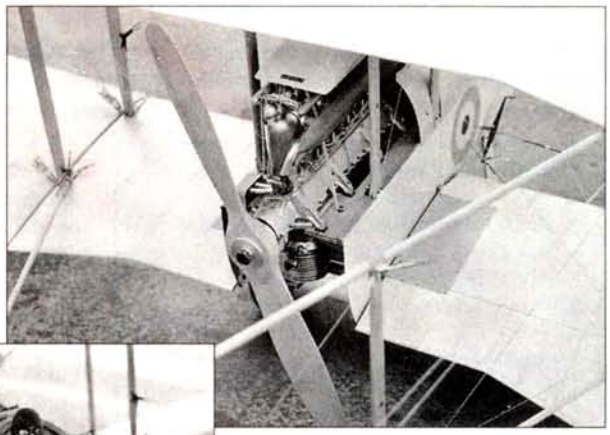
Nick Ziroli Jr. of Seldon, NY, built a beautiful Grumman TBM Avenger from his own plans and placed sixth overall. Nick also earned third place in the prop aircraft category and the High Static award. A remarkable project, from 5 feet away, one could not tell if Nick's TBM was a model. Nothing looked out of place. Modeled in 1/6 scale with a 108-inch wingspan, the model weighed in at a hefty 50 pounds and was the heaviest aircraft there. Lots of horsepower was provided with an Eagle 4.2 on a CH ignition system turning a 24x10 Zinger prop. This setup flew the aircraft in a very realistic manner. Nick's model featured a radio-operated, air-actuated folding-wing system that worked excellently. Nick dropped a scale torpedo as a scale maneuver. The aircraft had scale bomb-bay doors, retractable landing gear with retract doors, flaps and a retractable tail hook. Nick's aircraft only had a few flights prior to the competition but, with more flying experience, this will be a difficult aircraft to beat. Nick was only a mere half point away from a perfect 100 static score.

Nick Ziroli Jr.'s TBM is simply a work of art. With a static score of 99.5, Nick's Avenger is the talk of the R/C scale community. Considering its unfortunate crash at last year's Top Gun Invitational, the work Nick has done to repair and perfect the torpedo/bomber is inspiring—a job well done.





Randy Hansen readies his Cessna A-188 Agwagon for another flight. Check out the fine detail.



John Cole's de Havilland DH-1A is an unusual pusher WW I fighter. It uses an engine converted with a Davis Diesel head; it flew very slowly, but quite realistically. Good scale detail throughout; 7th place.

GARLAND HAMILTON NUMBER ONE AT THE MASTERS

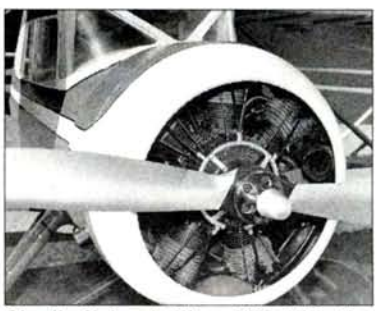
Garland Hamilton lights the fire in his DT-33A built from a BVM kit. The JPX T-260 turbine engine is fueled by propane.

The full-scale aircraft that Garland used as a subject was a Navy "drone director" stationed at Point Mugu, CA, during the 1960s. Garland's 1/6-scale model built from a BVM kit has an 80-inch wingspan, weighs 21 pounds and is powered by a JPX T-260 turbine fueled with propane. Engine rpm at idle are 40K and 120K at full throttle. The engine oil used is Exxon turbine oil. A 10-channel Airtronics Infinity radio system operates 12 servos. The model include retracts and wheels from BVM, operating landing-gear doors as well as wheel brakes that can hold the aircraft at full throttle. Scale flaps and speed brakes are also used.

Garland's aircraft certainly deserved to win this competition. It flew every round and taxied back each time. It looked scale, it flew scale and it sounded scale. What more can one ask for?

Ernie Harwood turns the prop over on his 1/4-scale Proctor S.E.5a as his helper looks on.

the weather is less than ideal, the slower and lower wing loading aircraft are at a disadvantage. The WW I aircraft bounce all over the sky, while the jets are rock solid in their maneuvers. Their flying speed could be more than 10 times faster than the WW I aircraft. Under the existing flight judging standards it is very difficult, if not impossible, for a judge to fairly evaluate the scale models' flight performances. This is especially true if many of the judges have never seen the full-scale aircraft actually fly.



Charlie Nelson's Waco VKS 7F is the product of years of refinement and documentation. The size of the Siedel radial engine is what dictated the size of Charlie's latest Waco.

Regardless of the ongoing controversy of which type of model is best to compete with, the Scale Masters remains by anyone's measure the best scale competition available. The event is held at different locations throughout the U.S., and this makes it easier for modelers from all over the country to compete. The models remain fresh and diverse. Next year the Scale Masters Championships are scheduled to be held in Fort Worth, TX. See you there.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

SR News

Techniques... *Techniques* is off to a great start. So many of you have subscribed and written for specific Volumes. I'd like to thank everyone who has called or written to tell us how much they like *Techniques*.

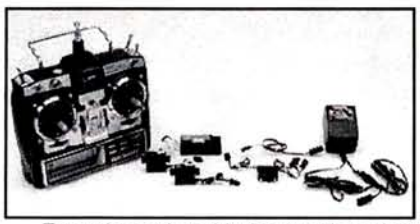
Volume R-3 of *R/C Techniques* is out. It covers the "Why" not the "How" of computerized transmitters. Have you ever noticed that the manual that came with your new radio tells you how to do something but it doesn't tell you why you might want to do that something? Volume R-3 covers the practical applications of all those *bells and whistles*.

There are two new Volumes of *Electric Flight Techniques*. Volume E-13 covers everything you need to know about Speed 400 flying. Motors, props, gearboxes, gear ratios, speed controls, battery packs, and the design parameters for the aircraft themselves are all covered.

Volume E-14 is a "How To" on converting the Hangar 9 giant scale Cub to Electric power. It covers the necessary kit modifications as well as motor, gearbox, prop, speed control and battery pack selection and installation. This is a must read if you're interested in giant Electric powered aircraft.

If you'd like information on how to subscribe to *Techniques* or order individual Volumes, just send us a SASE business size envelope with 55 cents postage.

A Radio System From SR!...



For a long time it's bugged us that no one sells the radio system we want to buy. If you're into Sailplanes, Electric Flight, or small aircraft, no one sells the latest technology radio system you'd like to have. Sure, you can buy the transmitter you'd like, but it comes with a receiver that's too big and heavy. The servos they include are too big and heavy and they're hardly ever the best servos made by that manufacturer. And finally, the receiver battery pack is too big and heavy.

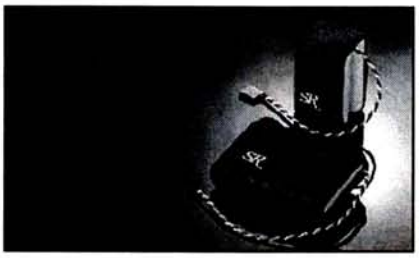
So, what do you do? You buy a new radio system and then go out and immediately buy a new micro receiver and micro servos. The receiver and servos that came with the system are left in the box.

We've ended all of that! We teamed up with Airtronics and put together a special radio system consisting of their Radiant computerized transmitter, their Micro 4 Channel receiver, and two of their Sub Micro 501 servos. We don't include a small battery pack in the system because you may not want one if you're using BEC. You get everything that you want and nothing that you don't. The box will be empty when you finish installing the gear. The price is $269.95 and it will save you about $150 compared to buying the components the old way. If you buy one of our X-440™ Sailplanes, we even take another $10 off the system!

X-Gearbox...

If you're flying a Goldberg Electra or a Great Planes Spectra Electric sailplane, this is a must have. Our X-Gearbox and a CAM 14x9.5 prop will cut your current draw almost in half and almost double your motor run. It will increase your climb rate by 150% and your total flight time by 400%. All with the same battery pack and **without modifying the nose of your aircraft!** That's right. The X-gearbox is a true planetary inline gearbox which is only 7/8" in diameter and 7/8" long. There's no ugly offset between the motor and prop centerline. The only modification to your aircraft is to move the motor back 7/8". That's it!

The best part is that by using inexpensive adapter rings the same gearbox can be used on Speed 400, Speed 480, AP29BB, Speed 500, Speed 600, SR Max7, or SR Max10 motor as well as the motor that came with your kit.



900mah Transmitter Packs...

Our 850 Series transmitter packs, which have a capacity of well over 900mah, continue to be our best sellers. They'll almost double the flying time of almost any transmitter. They're the same size and weight as the cells that came with your system and we'll make them up in any shape you'd like.

1000mah Receiver Packs...

If you're a pattern flyer, these are the cells for you. They're about the same weight and actually smaller than the pack that came with your radio but they're double the capacity. If you'd like more flying time for practice and competition, these are the packs for you.

New! 1800 Series Rx Pack...

Giant Scale flyers have wanted a higher capacity, bullet proof, receiver pack and now they have it! We've combined the ruggedness of our 1500 Series cell and the higher capacity of our 2000 Series cell and come up with the new 1800 Series. It's the same size and weight as the usual 1200mah cell but it has a capacity of over 1900mah!

If you'd like more information or to place an order, contact us at SR Batteries, Inc., Box 287, Bellport, NY 11713, Phone:516-286-0079, Email: 74167.751@compuserve.com

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MODEL AIRPLANE NEWS
ENGINE REVIEW

by MIKE BILLINTON

O.S. 140RX

A new F3A powerhouse

THIS HANDSOME, purposeful, 23cc 2-stroke represents the most recent thrust by this manufacturer toward success in the very prestigious F3A International Aerobatic class. Following the FAI's relaxation of engine size rules for this class, this 140RX tuned-pipe engine could well be thought of as the leader of the pack—the 2-stroke pack that is, which is busily pursuing the dominant YS 120 4-stroke (which is itself undergoing a capacity increase to 1.40ci to ward off this new threat).

Given the clear power advantage that the 2-stroke can now exhibit (having been freed from the large 2:1 handicap previously enforced), the question that is now really coming to the forefront is: just why did the 4-stroke preference (advantage?) still hold in 1996?—the first year of the new regulations.

Answers from within the pattern community still resound:

- The extra power is not a large advantage if accompanied by less swift and less linear throttle response.
- A natural conservatism among top competitors already well-attuned to the 4-stroke cycle will take more than one flying season to change.
- The 2-stroke's tuned-pipe system requires more thought and practice to ensure correct placement of flight rpm in relation to the usual steep-sided torque curves involved. Additionally, the "new," large-capacity 2-strokes, with their new and much lower rpm regimes, demand yet further experimentation—both with respect to required propeller sizes and to tuned-pipe lengths.
- The accelerating way in which a tuned pipe provides power response as the throttle opens is felt not to be the best solution for precise 'aerobatic' requirements. This is sometimes described as a "winding-up" effect, though it equally applies to the apparent 2-stroke inability to slow down when going "downhill" compared with the 4-stroke.
- Maybe it's not the 4-stroke cycle but rather the unique YS throttle/pump/crankcase charger system that is the real point. If so, surely this can be duplicated within the 2-stroke cycle?
- Do low rpm and the resultant long pipes lead to relative slowness of response?
- Is the apparent wind-up effect a subjective one tied to the 2-stroke's doubling of audio frequency?

These and other points could mark the end of the 2-stroke challenge in aerobatics were it not for the clear power and torque advantage that the 2-stroke seems set to enjoy for some while yet. The reason is that the possibility exists of giving up some surplus power and in return eliminating the exaggerated large response that tuned pipes usually offer.

This highly refined, stocky engine really pushes out the torque! O.S. quality is still unmatched.

This paves the way to less "peaky" tuned pipes—even reversion to the much milder minipipe half-wave device or the abandonment of tuned devices altogether. Comparing the very similarly shaped open-exhaust power curves of say, the YS 120 4-stroke and the O.S. 140 2-stroke has all the appearance of being a window into the future, with the likelihood that certain 4-stroke and 2-stroke engines will find themselves competing with virtually identical hp and exactly the same power curves!

The high power of this new 140RX 2-stroke should place it in a strongly advantageous position to benefit from the flexibility for power exchange referred to above. In any case, the FAI engine rule change has set the cat amongst the pigeons in a dramatic way. Future developments will be interesting to behold!

MECHANICAL DETAIL

Almost de rigeur now, the rigid and robust one-piece crankcase is a necessary feature for serious competition work in spite of high tooling costs. In contrast to the Webra 120's under-square stroke/bore ratio of 1.042:1, the 140RX opts for a quite over-square .894:1 ratio. As both engines will operate at virtually the same rpm with similar prop loads, this is an interesting commentary on the supposed necessary connection between long stroke and low rpm!

A single, ringed, aluminum piston runs in a hardened-steel liner with .003 inch skirt clearance. The 1.142-inch-diameter piston features an internally ribbed crown.

Schnuerle cylinder timings are moderate, with only a 15-degree blowdown period (between when the exhaust port opens and when the transfer port opens). Front induction timing is also moderate at 184 degrees total opening.

An unusual 8-bolt cylinder head is fitted with the glow plug protruding 1.5mm into the combustion chamber. The effective compression ratio is fixed at a low 7.12:1 because of the need to retard ignition timing for the low-rpm regime.

A simple, bulletproof 70A carburetor has a cadmium-plated throttle barrel and cam-operated secondary fuel control. The rear-mounted, remote, main fuel needle allows the operator to escape from those fearsomely sharp APC Scimitar props or the even more fearsome 4-blade Bolly carbon propeller!

A diaphragm fuel pump (type PD-06) mounted in the rear cover ensures positive fuel supply under varying G forces.

The total bare weight of only 29 ounces and high specific torque allow this deceptively simple but refined new engine to slot easily straight into a fine position in the following updated table of comparative

WEIGHTS AND DIMENSIONS

Capacity	1.40525ci (23.028cc)
Bore	1.260 in. (32mm)
Stroke	1.127 in. (28.626mm)
Stroke/bore ratio	0.894:1
Timing periods	Exhaust—146° (angled down 12°) Transfer—116° (angled up 18°) Boost—104° (angled up 55°) Front induction Opens—42° ABDC Closes—46° ATDC Total period—184° Blowdown—15°
Combustion volume	2.75cc
Compression ratios	Geometric—9.37:1 Effective—7.12:1
Exhaust-port height	0.303 in. (7.70mm)
Cylinder-head	0.026 in. (0.66mm)
Cylinder-head squish angle	1.5° (rounded edge)
Squish-band width	0.114 in. (2.90mm)
Carburetor bore	0.434 in. (11.04mm)
Crankshaft diameter	0.787 in. (20mm)
Crankshaft bore	0.591 in. (15.03mm)
Crankpin diameter	0.3145 in. (8mm)
Crankshaft nose thread	0.309 in. x 24 TPI (5/16 UNF)
Wristpin diameter	0.288 in. (7.32mm)
Connecting-rod centers	1.968 in. (50mm)
Engine height	4.66 in. (118.36mm)
Width	2.76 in. (70.1mm)
Length	4.57 in. (116.70mm)—prop. driver to back of pump
Width between bearers	1.929 in. (49mm)
Mounting-hole dimensions	2.283x0.984x0.201 in. (58x25x5.12mm)
Exhaust-manifold bolt spacing	1.338 in. (34mm)
Frontal area	9.8 sq. in.
Weight	Bare—29.0 oz. (822gm) With O.S. pipe & manifold—37.1 oz (1052gm) With Bolly pipe & manifold—37.9 oz. (1074gm)
Crankshaft weight	5.35 oz. (152gm)
Piston weight	0.65 oz. (18gm)

Manufacturer: O.S. Engines, Osaka, Japan.
U.S. distributor: Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021.

PHOTOS BY MIKE BILLINTON

In the piston, note twin transfer cut-outs that reduce weight and assist breathing. Rod is bushed at either end; big end has two lube holes; little end has one.

RPM ON STANDARD PROPELLERS

Propeller	Open Ex.	O.S. Pipe 725mm	610mm std.	550mm
20x10 Menz	—	6,130	6,110	—
21x10 Bolly	6,235	6,440	6,420	—
18x12 Menz	6,720	6,565	6,900	6,940
15.5x12.5 (4-blade) Bolly	7,225	—	7,460	—
18x10 (3-blade) Bolly	7,330	—	7,680	—
17.5x12 Bolly	7,830	—	8,110	8,390
16x14 APC	7,920	—	8,060	8,296
16X12 APC	8,710	—	8,560	9,130
15X8 Graupner	10,910	—	9,790	—
15X8 APC	11,120	—	10,020	10,720

	Bolly Pipe 770mm	720mm std.	670mm	585mm
20x10 Menz	6,360	—	6,460	—
21x10 Bolly	6,650	—	7,040	—
18x12 Menz	6,786	7,050	7,320	—
15.5x12.5 (4-blade) Bolly	7,076	7,440	7,710	—
18x10 (3-blade) Bolly	—	—	—	—
17.5x12 Bolly	—	—	—	—
16x14 APC	—	7,830	8,170	8,670
16X12 APC	—	—	8,675	9,360
15X8 Graupner	—	—	—	—
15X8 APC	—	9,890	10,200	—

PERFORMANCE

Maximum B.hp 4.03 @ 9,090rpm (Bolly pipe @ 585mm/10% nitro)
3.75 @ 14,130rpm (open exhaust/10% nitro)

Maximum torque: 443 oz.-in. @ 8,677rpm (Bolly pipe @ 585mm/10% nitro)
370 oz.-in. @ 6,700rpm (open exhaust/10% nitro)

PERFORMANCE EQUIVALENTS

Prop	O.S Pipe Open ex.	610mm std.
B.hp/ci	2.67	2.14
B.hp/cc	0.163	0.131
B.hp/lb.	2.02	1.30
B.hp/kilo	4.56	2.86
B.hp/sq.in. frontal area	0.38	0.307
Oz.-in./ci	263.30	275.40
Oz.-in./cc	16.07	16.80
Oz-in./lb.	204.10	166.80
Foot-lb./ci	1.37	1.43
Nm./cc	0.115	0.12
Nm./kilo.	3.21	2.63

Prop	Bolly Pipe 720mm std.	585mm
B.hp/cu.in.	2.12	2.87
B.hp/cc.	0.129	0.175
B.hp/lb.	1.26	1.70
B.hp/kilo	2.77	3.75
B.hp/sq.in. frontal area	0.304	0.41
Oz.-in./ci	294.60	315.20
Oz.-in./cc	17.98	19.24
Oz-in./lb.	174.70	186.90
Foot lb./ci	1.53	1.64
Nm./cc	0.128	0.137
Nm./kilo.	2.75	2.95

performances of top engines so far tested by this writer. Only those engines that combine high torque/cc and high torque/weight ratios are in this list, and this results in predominantly light aircraft engines having higher than average cylinder pressures being listed.

As can be seen, there is a clear scale effect at work that favors large engines, so any high position by small- to medium-capacity engines here is noteworthy.

Open exhaust; methanol fuel; 5 to 10 percent nitro.

	Displacement	oz.-in./lb.	oz.-in./cc
Enya 80XF	12.5cc	142	13.6
Fox Eagle 74	12cc	140	13.7
Moki 180	30cc	164	14.13
OPS 80 fan	13cc	134	13.8
O.S. BGX	35cc	156	13.0
O.S. 120 s/c	20cc	132	15.0
O.S. 91 fan	15cc	133	14.2
O.S. 140RX	23cc	204	16.1
S. Tigre G4500	45cc	147	14.1
S. Tigre G90	15cc	176	14.9
Webra 120 S/E	20cc	170	14.0
Webra Speed 50	8.4cc	146	13.8
3W B120 twin. (petrol/spark)	114cc	200	14.7

PERFORMANCE

The ringed piston with hardened-steel liner has led O.S. to advise a meaningful running-in period of at least 10 flights. That's certainly more than for the typical ABC engine, and the need for this was clear during my tests: performance definitely improved with run time.

The propellers used covered the rpm range between 6,100 and 10,700, while torque tests allowed rpm to range between 3,500 and 14,150 to ensure that full torque and hp information was obtained.

All tests were done using: fuel—10% nitro/12 percent ML70 synthetic with 3 percent castor oils and balance methanol; plug type—O.S. A5.

O.S. 140RX F3A/ 2-stroke	Wind 1mph				
3 meters (FAI int.)	16x14 APC (CS pipe @ 620) (8,000rpm)	99	90	98	97
	15.5x12.5 Bolly (4-blade) (CS pipe @ 620) (7,400rpm)	102	92	98	97
	18x12 Menz (CS pipe @ 725) (6,600rpm)	97	92	94	95
7 meters at BMFA/U.K.	16x14 APC	92	79	89	88
	15.5x12.5 Bolly (4-blade)	95	79	89	88
	18x12 Menz (details as above)	99	90	98	97

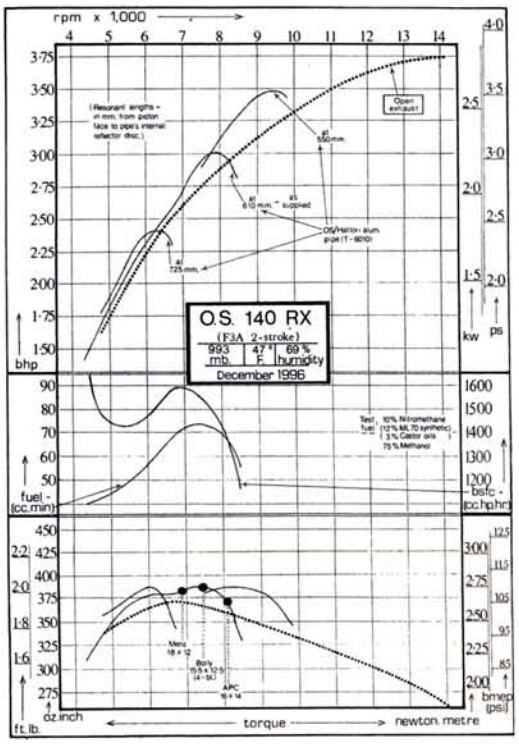
dB meter

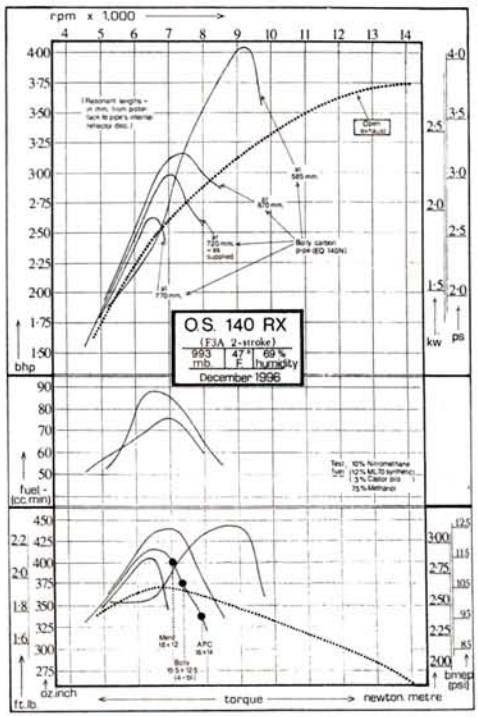
Engine: O.S. 140RX
Equipment: O.S. Hatori pipe
Fuel: methanol with 10% nitro
Temperature: 35°
Humidity: 81%
Pressure: 1002mb
Meter: Radio Shack type 33-2050 using GA601 calibrator set to NPL standards
Height: meter and engine set approximately 1 meter above concrete
Location: outdoors, next to farmland

It's probably no coincidence that maximum open-exhaust torque occurs at the rpm range that's likely to be used in competition, but the modern 2-stroke is seen to go on releasing power in a widespread, smooth manner. It is that type of power production, which, if we read the 4-stroke apparent advantage correctly, could so easily be harnessed in this 2-stroke by say, the use of 2-stage inline standard silencing cans. This could lead to an acceptable power loss of between 15 and 20 percent, much of which could, though, be recouped by the use of nitro.

To prevent confusion, separate power graphs have been used for O.S./Hatori aluminum- and Bolly carbon-pipe tests, showing the particular results relative to the open-exhaust tests.

Used at the supplied length, the O.S. pipe produced best resonance in the 8K area while the Bolly's supplied length gave a lower and maybe more usable rpm range for best resonance at 7K. In both cases, though, it is quite noteworthy that highest power is not reached with the supplied lengths.





O.S./Hatori pipe and manifold (front) with Bolly carbon pipe (back).

Put simply, these new, large 2-strokes are trapped in an rpm area around 7 to 7.5K because to exceed those speeds means sound-level problems, while to go lower in rpm means that power is dropping off considerably in spite of optimizing pipe lengths. The shortest Bolly pipe used here vividly demonstrates this finding because a considerable power boost is available but cannot be used in competition because of the sound checks.

From these tests, it was clear that, yet again, a Bolly proprietary carbon pipe has succeeded in generally improving torque levels when compared with the manufacturer's own favored pipe—in this case, though, with slightly sharper power peaks.

Both pipes feature the now very popular internal reflector disk rather than the more traditional reverse cone, so other internal differences must account for the power advantage revealed by the Bolly pipe.

These pipe results are as expected, with the usual steep decline in torque as rpm rise following full pipe resonance. However, the recent unusual Webra 120R result proved to be less severe, and that led to a wide, flat top to hp. So ... who will be first to match that pipe with this 140RX?

IDLING AND THROTTLE RESPONSE

Using the APC 16x14 prop and the O.S./Hatori pipe at its standard length of 610mm saw a range of 2,000rpm easily achieved within the quite small range of secondary needle idling control available. Response to full throttle was quite swift, though, with slight evidence of the delaying wind-up effect referred to earlier.

SUMMARY

If the 2-stroke challenge in F3A can succeed, then the O.S. 140RX will be in the forefront of that achievement. Its inherent quality alone will give it a considerable edge in this battle.

9TH ANNUAL

SMALL Steps Fly-In

Good things come in small packages!

by RANDY RANDOLPH

PHOTOS BY RANDY RANDOLPH

BUILDING MODEL aircraft is a very personal hobby. Few modelers build because of the desire to impress others with their ability. Most build to satisfy their desire to create something that is uniquely their own. Since small models can be built with little time and monetary investment, they offer unlimited opportunities to express this creative urge. Since modeling is such a personal thing, those who find it the most attractive are somewhat introverted and do not tend to be joiners in the strictest sense. This brings up an interesting problem: how do you set up a social organization that allows these people to get together with one another and enjoy time together? It must be free of the pressure of competition, open to any and all modeling types and have a single limiting factor: size. The small size tends to limit egotism while bringing out the creativity of the modeler!

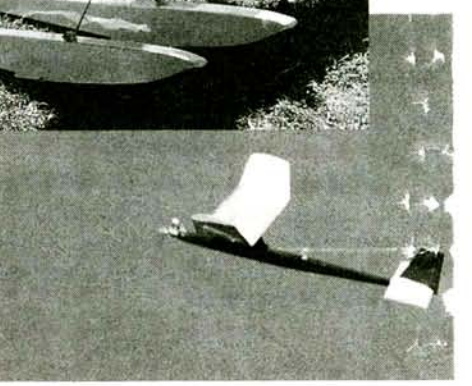
The Small Model Airplane Lovers League (SMALL) was created to be just such an organization. SMALL has members all over the world in truly uncountable numbers, because no registration is required for this no-rules organization. Knowing the importance of SMALL, in 1988, *Model Airplane News* founded the SMALL Steps Fly-In, which is open to any model airplane that's powered by an engine of no more than .26ci displacement. The event is held on the second weekend in October and is looked after by the Dallas R/C Club, whose flying site is in Seagoville, TX, a Dallas suburb.

Dan Tips fuels his Sukhoi while his friend Adriane Dennis looks over his Me-109. The Sukhoi was lost due to a faulty solder joint, but the 109 survived—even though there were Spitfires around!

The 1996 event drew SMALL Steppers from states as far from Texas as Pennsylvania and California! The weather forecast for the SMALL Steps weekend was for winds of 25 to 30mph—not too inviting for rubber- and .01-powered airplanes. Fortunately, the weather bureau missed that forecast by quite a way, but it did limit some of the out-of-town entries, so the turnout was smaller than usual. Still, the air was full of airplanes from 9 a.m. till dark on both days.

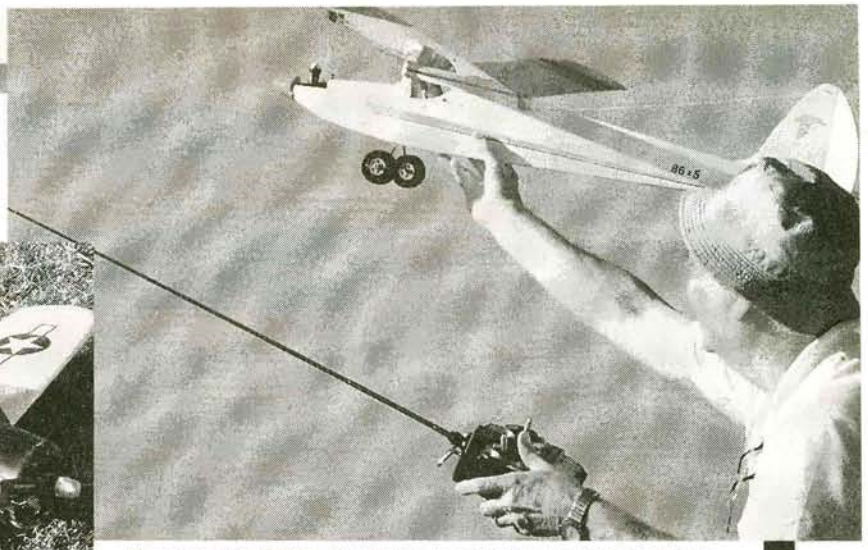
Last year, Ross Wood impressed everyone with his enlarged Answer, which cruised quietly over the field most of the day. In '96, he was not alone. Eddie

Right: another bird that opted to roll instead of float was John Cury's Great Planes .20-size Cub. The little bird nestled under the Cub's wing is a 2-channel .02-powered Oriole.



Left: beyond the comfortably seated Ernie Harwood flying his Playboy Jr. is the lake at the north end of the Dallas R/C Club's field. Several float flys are held there each year, and it was open to any SMALL Stepper who wanted to dip a float.

There were quite a few more O.S. .26 FSR-powered airplanes. This House of Balsa T-6 by Jim Olive is a good example.

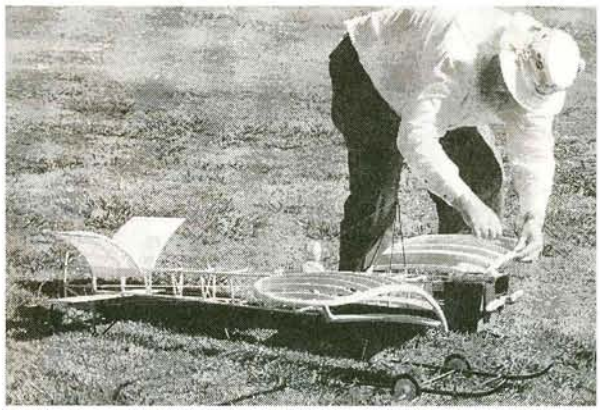


The perennial SMALL Stepper Emmett Fry launches his original 86+5. The name comes from the fact that it is his 86th design and this is the fifth one he has built. According to Emmett, it is now perfect!

Williams' Dragonfly, a Miss America built by the late Tommy Day, Ernie Harwood's Playboy Jr. and my Bombshell joined the balsa overcast at the north end of the field. This is truly relaxed flying. On the other end of the size spectrum, Scott Johnson and Jim Olive flew their small scale airplanes as if there were no wind. Scott's Spitfire and Jim's AT-6 flew as though on rails. While the big airplanes were parked high above the field, these pilots put on a show of precision aerobatics with their .15-powered airplanes that would compare with the best of pattern flyers.

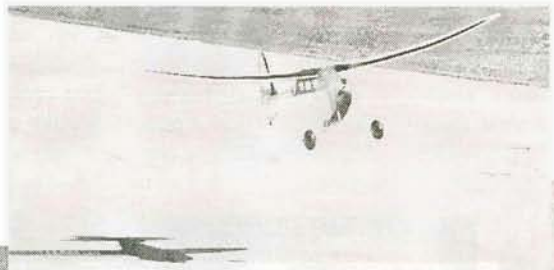
Al Sugar and friends set up a high-start at the south end of the field and, along with Steve Staples and his rubber-powered air force, had the quietest airplanes on the field. The number of diesel-powered airplanes exceeded the number in attendance last year, and they were almost as quiet as the electrics. Small diesels seem to be growing in use all over the country because of their power, miserly fuel use and low noise.

The Saturday night dinner at the Casa Cavasas Restaurant drew at least 20 SMALL Steppers who spent the rest of the evening in my shop talking model airplane. Interestingly enough, on the Saturday night when the SMALL Steps dinner was being held, an indoor record trials (mostly for EZB, F1D and Pennyplane events) at Bedford, just west of Dallas, drew some of the SMALL Steppers away from the food. Ernie Harwood slipped over to Bedford and was able to fly his indoor electric R/C to what is expected to be a new record!



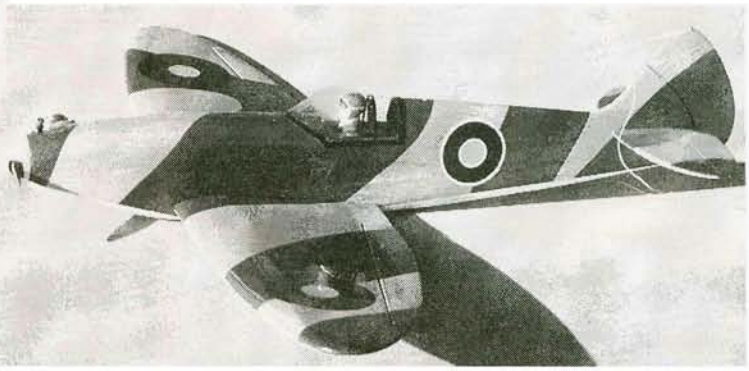
After Ross Wood learned how to build curved wings, he lost his head completely! His nearly completed .26-powered 1914 Huntington Clam was built by scaling up a rubber model plan.

If you plan to be in Dallas this year on the second weekend in October, it would be wise to make your reservations now, because that is the weekend of the Texas vs. Oklahoma football game as well as the busiest weekend of the Texas State Fair—both in Dallas at that time. Oh, if you haven't done it yet, place your hand on your heart and proclaim, "I promise to build and enjoy small model airplanes." That makes you a lifetime member of SMALL. ✈



Above: Ross Wood's beautiful Answer floats over the runway. The model whispered over the north end of the field during most of the Fly-In and was joined by several other floaters.

Left: the biggest airplane of the Fly-In, this Dragonfly entered by CD Eddie Williams has a 6-foot wingspan. With its .26 throttled down to idle, it floats with the best of them. The Dragonfly appeared as a construction article in "Model Builder" magazine almost 20 years ago.

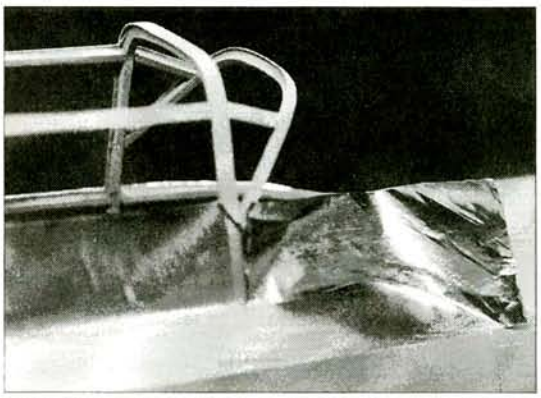


Scott Johnson's O.S. .15-powered PMA Spitfire is one of the smoothest flying airplanes around. Scott also brought a .15-powered PMA Mustang that equaled the performance of the Spit.

Scale TECHNIQUES

by BOB UNDERWOOD

METAL PANELS AND NASA



Applying metal panels to a scale model is easier than you think, if you know the technique. Here, aluminum heating-duct tape is being worked into place to create the panel below the canopy. Use a round dowel or the end of a marking pen to burnish the tape into place.

A BUNDLE OF years ago, I wanted to simulate raised metal panels and fillets around tail surfaces and wing roots. A club member who worked for Ozark Airlines suggested that I use some "600-mile-per-hour tape." Being the flip wag I am, I asked him how I would ever catch the tape! Grasping my neck firmly, he politely explained that it was metal tape, 6 inches wide, with a serious adhesive backing, capable of being "worked" or molded smoothly around compound curves. Yeh, it works well! But! (Don't you hate those buts?) The stuff weighs a ton, costs a bundle, and even the smallest quantity that can be purchased would take care of all the scale models produced for a period of 100 years.

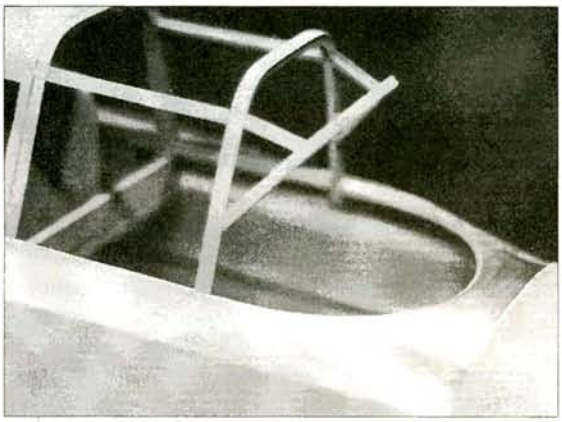
Flat panels were never a problem. They can be faked with thin litho plate. But that stuff is hard to come by now. It also has a problem if used in long pieces. I used it once to simulate a seam running the chord of a wing. Glued down, it looked great! However, in the hot sun, the metal expanded more than the balsa under it, and suddenly, the strip resembled the Loch Ness monster undulating its way through the loch!

I've also used Aero Plastic (.010 thick) sold by Sig Mfg.* It attaches well, looks good, takes paint well, and it's light. So it's perfect, eh? Well, not completely, because if you want to weather the model, it doesn't "show metal" when you wear away the paint. Both the litho plate and the Aero Plastic will bridge openings in sheeted material if you have to hide something you may need to get to later.

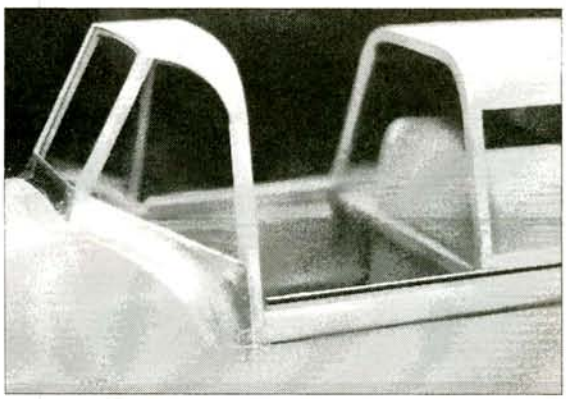
The next thing I tried is the material sold by Jeff Foley's* company. It really works quite well. It's light, accepts paint, sticks well, has a metal color, etc., although it doesn't seem to stretch quite as easily as some material, so molding it around sharper, compound curves requires a little more care.

My present model effort is graced with tape found in a hardware store and intended for sealing heating ducts. No, not the adhesive-tape-style "duct tape," but a lightweight, shiny aluminum metal tape 2 inches wide. It peels off a paper backing and is very workable around the curves. It's also cheap (sorry, "inexpensive"). If you put it on after the primer coats (or most of them) and then shoot a light coat of automotive primer over it, you can burnish the edges to make a nice, weathered finish.

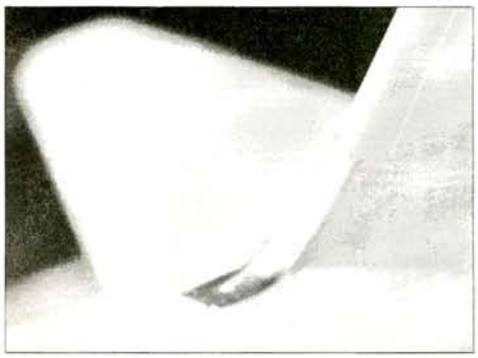
Applying the material is easy. You can cut the panel or fillet to the proper shape and size and lay it directly on the model surface. Then, taking a smooth, rounded dowel end or even the blunt end of a plastic pen like a Sharpie, work the material into place. Trying to stretch it too far will split it.



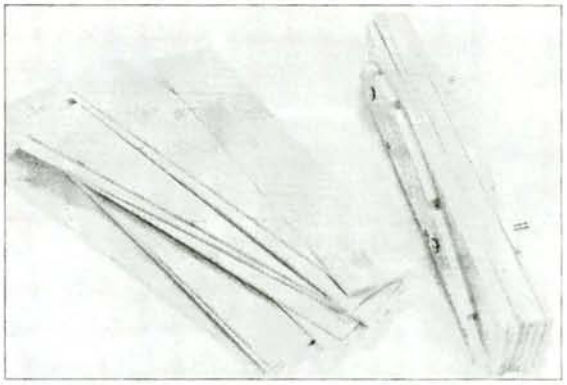
The finished panel awaits priming and glue-drop rivets. Later, the edges of the panel can be lightly sanded or rubbed with steel wool to "weather" the painted finish.



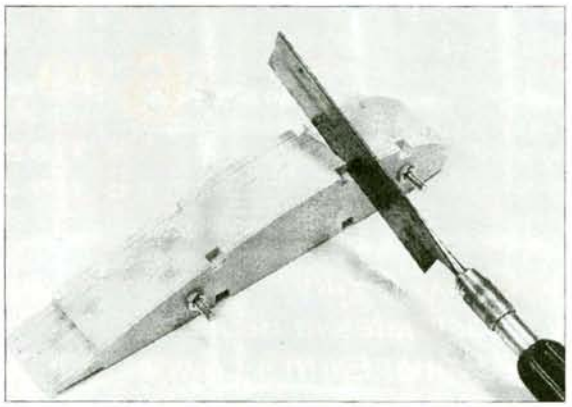
Here, the smaller, lower front canopy frame panel has been applied. Start in the middle of the panel and work out. Aluminum tape is really fun to work.



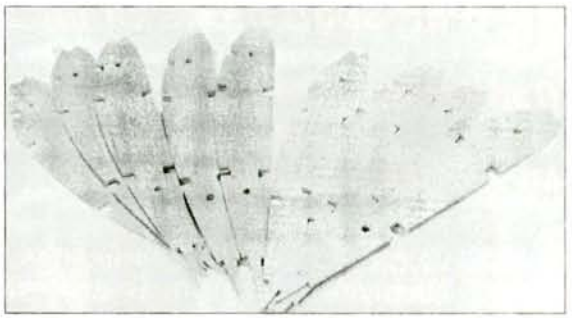
Yep! A lot of fairly small-radius compound curves can be found on a typical scale model. Most of them are in the form of separate panels. Take your time.



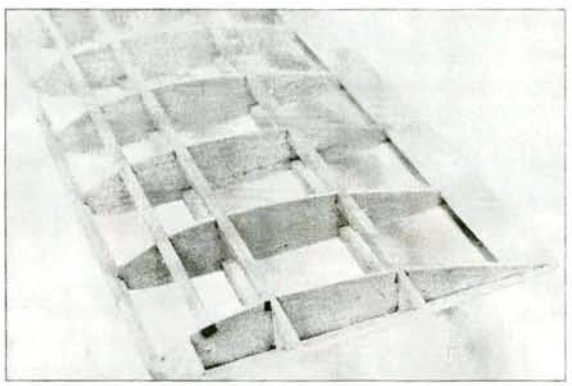
So you need a rib or two? A couple of plywood forms (templates), a stack of balsa blanks, a little carving and sanding, and you have them.



Use a razor saw to cut the spar openings. The remaining pieces are cut away, and the edges of the openings must be dressed with a sandpaper-covered piece of wood.



There they are! Bring on the spars and leading and trailing edges.



Here, a trainer's wing shows how easy a constant-chord wing is to make using the stacked balsa/plywood template method. You can also make tapered wings using this technique, but it is a little more involved.

However, this can be overcome for really compound shapes—like the leading edge of a stab where it meets the fuselage—by cutting half-moon shapes to match the curve. The pieces can also be cut somewhat oversize, and after seating, the exact outline can be achieved with a sharp hobby blade; just peel away the unneeded material.

After the final paint job, you can attack the panel edges with 400-grit sandpaper or steel wool and voilà, weathering occurs. Use logic about where weathering occurs on an aircraft, and secondly, don't get carried away and make it look as if the aircraft has been setting in the middle of the Sahara Desert since 1942!

STACKING RIBS

I've got a few pictures this month showing a stack of ribs being formed for a model. The process is so simple. Cut two plywood forms for the root and tip outlines. Drill two holes through the forms for long stove bolts. Cut rectangular balsa blanks, oversize, and stack them between the plywood pieces. Drill holes through the balsa, and bolt the stack together. Carve and final-sand the stack.

The spar openings can be made by cutting the outside edges of the openings with a razor saw and then using a no. 11 knife blade, a file, or even your fingernail to flip the pieces out of the slot. Finish the job with a piece of 220-grit sandpaper wrapped around a section of wood, and slide it back and forth in the slot.

Will this process work for tapered wings? Yes! The job is complicated by two issues. First, you have to start with the tip rib outline somewhat oversize since the taper will cause an exaggerated slope on the edges of the rib blanks. When you dress the slant from the individual rib, you may find the tip ribs too narrow and too short. One way I've handled that is to throw in an extra rib blank (or two) at the tip, then not use them! Crude? Yes! Does it work? Yep! Another possibility is to divide a long, tapered wing panel into two sections and actually create three plywood templates with one halfway out on the panel and create two sets of ribs for each panel.

You must also watch the relationship of the root and tip ribs with regard to the taper of the wing. You will have to make certain the leading- and/or trailing-edge sweep is correct before you drill the holes through the plywood rib patterns. Incidentally, you can also help create washout in the tapered wing by angling the tip rib inward relative to the root rib. The process works and creates at least a normal month's worth of balsa dust.

NASA TURNS 20

This July, we celebrate the 20th anniversary of the formation of the National Association of Scale Aeromodelers (NASA). I was its first president, and I once again find myself in that position, following the lengthy and productive tenure of John Guenther. It's hard to believe that 20-plus years have passed since I wrote prose, printed in purple on the school's ditto machine, imploring scale types to meet during the 1977 Nats at Riverside, CA. But the time has passed. We did meet. And NASA became a reality as an AMA Special Interest Group. I would love to relate that we have solved all the problems relating to scale modeling, have reached every soul remotely interested in scale and have

profoundly shaped the future of scale. But to do so would be as honest as that old friend who states—after not seeing you for a long while—that you haven't changed a bit! It's safe to say that our 400-plus members represent only a relatively small percentage of those individuals interested in the building and flying of scale models.

As with any organization, the prospective member asks the question, "What can the group do for me?" That's a toughie! In volunteer, association-style organizations, the answer is often, "Not much!" This is true since it is the collective voices of the members that provide the thrust that makes it all work. In essence, then, it is, "What *you* can bring to the organization" that is the real key.

Over the years, NASA has provided a lion's share of help for various events. Additionally, it has helped fund FAI team activity, Nats and has been a prime mover in creating and running two scale world championships in the U.S. On a personal basis, NASA provides an excellent communications vehicle through its newsletter, "Replica." Many lost souls wandering about in the throes of acquiring documentation have been helped through pleas printed in "Replica." Additionally, every member is provided with a copy of a Scale Data Source List that is an extremely valuable tool. This 47-page booklet contains several hundred listings of sources for plans, 3-views, photos, museums, collections and organizations that can help you find that information about the elusive Widget 10 you want to build. Certainly, the material in this document, the informative articles in "Replica" and the ability to help create a strong voice for the scale community are worth the $9 per year dues.

For additional information, you can contact me at (314) 447-4235 or (314) 939-3394. Better yet, mail a check (made out to NASA) to Bert Dugan, Secretary-Treasurer, 11090 Phyllis Dr., Clio, MI 48420. Indicate that you wish to join, and he will fire off a membership card and a package of goodies.

I'm looking forward to seeing all of you at the FAI team selection event at the Nationals site in Muncie, IN, on July 7-10, followed immediately by the control line and R/C scale portions of the Nats on the 11th through the 13th. And, oh yes, will I find your name on the NASA roster for 1997?

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by GERRY YARRISH

AFTER THE EXTREME "rekitting" of my last giant-scale warbird, I decided to start this time with a lighter, simpler aircraft. I wanted something different that had fixed gear. I saw someone at an IMAA rally put an Ohio R/C Models* Super Chipmunk through its paces. With its Pennzoil aerobatic paint scheme, it didn't look much like a warbird, but that would be easy to fix.

I figured it wouldn't take much work to transform the Super Chipmunk into the earlier de Havilland DHC-1 trainer that the Super design was based on. What a pleasant surprise I had when Bob Ankany, owner of Ohio R/C Models, told me that he had a Chipmunk trainer kit available. It has the properly shaped engine cowl and canopy to depict the military variant of the Chipmunk—the subject of this review.

Easy-to-fly IMAA warbird trainer

OHIO R/C de Havilland DHC-1 CHIPMUNK

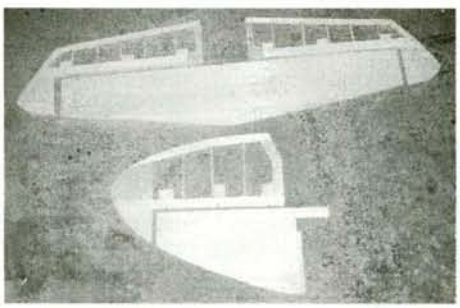
PHOTOS BY GERRY YARRISH & WALTER SIDAS

THE KIT

Ohio R/C's Chipmunk kit is available in three versions: the Super Chipmunk Pennzoil with wheel pants, the Super Chipmunk Pepsi with a Continental engine cowl and the DHC-1 military trainer with Gipsy Major cowl style and a framed canopy.

The basic difference between the scale outline of the model and that of the full-size aircraft is that the model has a flat-sided fuselage cross-section with a rounded turtle deck instead of an oval fuselage cross-section. This makes it much easier to build quickly. Construction follows conventional built-up practices.

The kit comes with a very nice construction booklet, and to help you keep

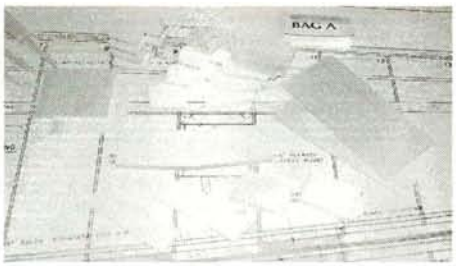


The tail feathers are easy to build and are partially sheeted with balsa. Notice the hinge blocking added for the use of Robart Hinge Points.

track of what you've done, it has check-off-as-you-go squares next to each step. So that you can make sketches of your paint scheme, in the back of the booklet, there are some 1/10-scale, top and side drawings of the model. Available separately are fuselage and wing kits, wing-rib sets, tail kits, cowls, canopies and an accessory package that includes a 3-inch spinner, 4-inch wheels, a tailwheel, a fuel tank, fuel line and 4-40 pushrods. Custom decal sets are also available.

CONSTRUCTION

The instructions tell you to start with the wing, but as a warm-up, I built the tail feathers first. The fin, stab, rudder and elevator halves are assembled over the plans out of 1/4-inch- and 3/8-inch-thick balsa, and there's nothing unusual here. For strength and scale appearance, the horizontal and vertical stabs are fully sheeted with 1/16-inch-thick balsa. I wanted to use Robart* Hinge Point hinges throughout the

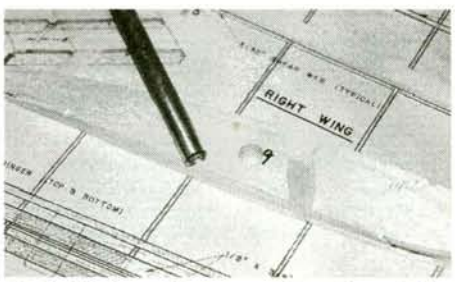


Some of the many wing parts that come bagged for easy identification—the plywood hatches, landing-gear doublers and wing joiner. Wood quality is outstanding.

construction, so I had to drill 1-inch-deep holes for them to be glued into. Before drilling, I added balsa filler blocks at each of the hinge-point locations. This was my only deviation from the instructions.

• **Wing.** The wing has a unique transitional airfoil shape. The root airfoil is a NACA 2414, and the tip utilizes a NACA 4412 airfoil. The tip is slightly under-cambered, and this pays a dividend in reduced tip-stall characteristics, especially at landing speeds.

The wing is built with two plywood support strips (supplied) that are placed



To facilitate routing servo wires through the completed wing, I installed Estes wing tubes. To cut the holes in the wing ribs, stack the ribs and use a sharpened 1/2-inch brass tube.

under the trailing edge and the main spar before the wing is assembled over the plans. These support strips ensure that the proper amount of washout is built into each wing panel. Though the construction technique was a bit unusual, I found the wing easy to build.

Before I glued the ribs to the spruce spars, I cut holes in them for the servo-lead wire tubes. So that I'd be able to snake in the servo leads after the wing had been finished and covered, I used Estes* model rocket tubes as conduits. To make all the holes in the ribs line up, I stacked them on top of one another and inserted a small length of spar material into the bottom spar slots. With all the slots aligned, I cut through the ribs with a sharpened piece of

SPECIFICATIONS

Model: de Havilland DCH-1 Chipmunk

Type: sport-scale monoplane

Wingspan: 82 in.

Wing area: 1,100 sq. in.

Weight: 16 lb.

Wing loading: 33.5 oz. per sq. ft.

Airfoil type: semisymmetrical

Length: 66.5 in.

Engine req'd: .90 to 1.08 2-stroke, 1.20 to 1.50 4-stroke.

Engine used: Zenoah G-23 (1.37ci)

Prop used: Zinger* 16x6

Radio req'd: 4-5 channels (rudder, elevator, throttle, ailerons; flaps optional)

Radio used: JR* X-347

Price: $279

Features: the Ohio R/C Chipmunk comes with all balsa and plywood to complete the model as well as a fiberglass cowl, formed clear plastic canopy, basic hardware, full-size rolled plans and an instruction manual.

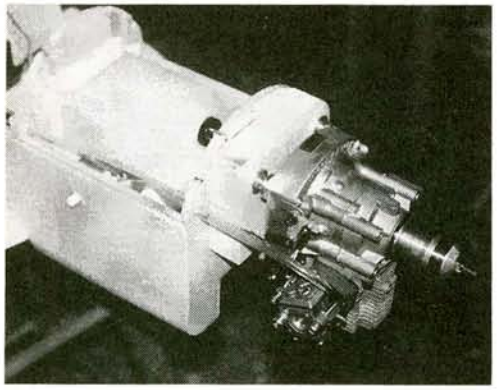
Comments: the Chippy is a great first IMAA warbird and performs nicely. With the addition of Robart Oleo landing gear struts and slotted flaps, the model has improved scale appearance and improved landing characteristics. The Chipmunk is available in three versions (see text).

Hits

- Easy to build.
- Good flying characteristics.
- Excellent materials in kit.
- Sturdy, lightweight construction.

Misses

- Some minor discrepancies in the instruction manual.



Prior to sheeting the top of the fuselage, a Sullivan 16-ounce fuel tank is installed along with the throttle linkage.

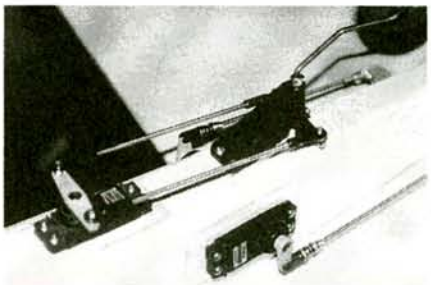
brass tube. With the ribs in place in the wing, the holes align, and the rocket tube slides easily into the wing.

After I joined the wing panels, I cut the ailerons and flaps out of the wing. The ailerons are detailed on the plans and are easy to build. Optional flaps are also illustrated on the plans. For better scale appearance, I designed and added my own slotted flaps to the wing. I then covered the wing, installed the servos and fitted all the associated linkages for the flaps.

• **Fuselage.** The fuselage can be assembled quickly. For strength, 1/2-inch- and 1-inch-wide triangular corner stock is used in the fuselage corners to allow rounding. No lower cross-grain fuselage sheeting is shown on the plans, but I installed 3/32-inch-thick balsa from the wing's trailing edge to the end of the tail. Ohio R/C feels that, because of the large, 1-inch triangular stock glued to the lower fuselage corners, the sheeting isn't really necessary. I agree, so you can go either way; the weight gain is minimal.

The top of the fuselage is covered with 3/32-inch balsa sheeting that goes over the formers and is supported with stringers. I used ammonia to help bend the sheeting into shape; after the ammonia had evaporated, I removed the sheeting from the fuselage, applied Elmer's yellow carpenter's glue to the formers and reinstalled the sheeting. Wide strips of tape and a few pins and rubber bands held the sheeting in place until the glue had dried.

I installed the elevator and rudder servos in the tail as shown on the plans. There's no detail shown for their installation. I sim-



All the fuselage servos except the throttle servo are in the tail. I used Robart ball-link control horns and 4-40 threaded rods to connect the servos to the elevators and the steerable tailwheel, which also drives the rudder.

FLIGHT PERFORMANCE

Because I had set it up too nose-heavy, my Chipmunk's first flight was, at best, uneventful. For the first flight, I had set the CG at about 1/4 inch in front of the location shown on the plans; this proved to be a mistake. With a 15x6/10 prop, the G-23 tached about 8,000rpm. To fly straight and level, almost full up-elevator trim was required with 3/4 throttle. For the second flight, I moved the battery pack 14 inches aft (new CG located 1/4 inch behind suggested location), and I replaced the prop with a 16x6, which produced 7,800rpm.

• Takeoff and landing

The Chipmunk is a great scale trainer; it does everything that you would expect from a tail-dragger. A fair amount of right rudder needs to be fed in as you push the throttle to the stop, and the Chippy won't bury its nose as you bound down the runway. After about 100 feet, you need to apply a little "up" to break the wheels free; from there on out, the Chippy does exactly what it's commanded to do. Roll and pitch stability are very good.

Landings without flaps: the Chippy glides extremely well when you pull back the power, and it will cover a lot a ground if you keep the nose down. You can really slow the model by pulling the elevator way back, and there's no tendency to tip-stall or get squirrelly. Dead-stick landings are a piece of cake, and you're more apt to overshoot your landing than fall short of the numbers.

Landings with flaps: here is where landings become fun and effortless. With about 25 degrees of flaps dialed in, the Chippy lands exactly where you want it; spot landings and short field landings happen almost by themselves. When you go downwind, reduce power to 50 percent and extend your flaps slowly. If you reduce power, there isn't much nose-up reaction with the flaps deployed. Keep your turn to base and final approach shallow, and set up for final with the throttle set at about 25 percent. The rate of descent increases, but airspeed does not. Adjust the glide path with small blips of throttle until you're over the numbers, and then pull the power to a high idle and start to pull in up-elevator. Pitch control is positive all the way to touchdown, but aileron control diminishes, so rudder should be used to keep the wings level. Rollout is very short.

• Low-speed performance

With the power pulled back to about 60 percent, the model flies very well and scale-like. Ailerons remain effective, and pitch control is solid; rudder is the most powerful control you have, and it can overtake the ailerons in slow turns. This isn't anything to worry about, but keep the ailerons and rudder inputs coordinated. For nice balanced turns, you need about 10 to 15 percent rudder.

Pulling the nose up sharply drastically reduces airspeed, so go easy with elevator in turns close to the ground. Stalls are very mild with the wings level, and recovery is normal; with the wings cranked over to about 30 degrees, however, the stall will work its way into a spin—a mild spin that's easy to deal with.

• High-speed performance

At full throttle, control is brisk, and the model remains extremely stable in all flight modes. High-angle pylon turns are simple, and with the suggested control deflections, tip-stalling and high-speed stalling aren't a problem. With the G-23 for power, the model is not at all overpowered, and in gusty or windy conditions, you'll find that flying at higher power settings is more comfortable.

• Aerobatics

All rolling and looping maneuvers can be best described as "scale." Because I wasn't interested in unlimited vertical performance, I chose the gas-powered Zenoah G-23 engine. With this engine, the Chippy will loop and roll on command with a slight diving entry to build up airspeed. Flying into the wind, loops are large and comfortable and can be flown without pulling back power. Rolls are slow and comfortable with the suggested aileron deflections, and a fair amount of "top" rudder and down-elevator while inverted prevent the nose from dropping. Split-S's, Immelmanns and stall turns are all easily done, but again, throttle control is the key to flying them well. Spins are easy to enter, but more important, they're very easy to get out of. Inverted flight at high speed requires only slight down-elevator (the only time I got a tip-stall was when I flew slowly, inverted with full down-elevator).

Using a lighter O.S. 1.20 or a Saito 1.50 4-stroke engine and building the wing without flaps would turn the model into a hotter performer. I built my Chippy for giant-scale warbird rallies, and I'm extremely pleased with the outcome.

ply cut the openings in the fuselage sides and glued a 3/32-inch-thick plywood plate over them. I then glued 1/8-inch plywood strips under these plates where the servo-mounting screws are located. The servos simply drop into the openings in the plywood plates, and the servo leads and extension wires are routed forward to the radio compartment. Short pieces of 4-40 threaded rod connect the servos to the control surfaces.

My only fuselage modification was the addition of side strakes to improve scale appearance. I made these out of 3/8-inch-thick balsa and glued them to the leading edge of the horizontal stabs, where they intersect the fuselage sides.

Before sheeting the nose section, I painted the interior with finishing resin to fuelproof the fuel-tank compartment, and then I installed my fuel tank. I used a Sullivan* 16-ounce fuel tank with gasoline-proof tubing, and to route the fuel to the engine, I used a Sullivan fuel-filler valve.

The completed Chippy awaits 21st Century covering. A fiberglass cowl and a clear plastic canopy are included in the kit.

I incorporated slotted flaps into my Chippy's wing, and the result is impressive—scale appearance and greatly lowered landing speeds.

• **Firewall forward.** I installed an older generation Zenoah* G-23 gas engine and mounted it with aluminum standoffs made by B&B Specialties*. To bring the engine to its proper location, I built a small plywood-box support structure and glued it to the firewall. To securely attach the box to the firewall, I used short pieces of aluminum L-angle stock and screws. The throttle cable is a plastic Nyrod that's connected to the carb with Rocket City* ball-link clevises. The throttle servo is mounted directly behind former F2 and is supported with plywood and hardwood rails.

The G-23 provides great fuel economy. It fits well inside the cowl; only the carb and a little of the exhaust header stick out. My only problem with the G-23 is that I couldn't find an "in-cowl" muffler for it. The closest thing available is from Slimline*, but it was designed for an engine that has had its stock ignition module removed and an electronic ignition added. Because my engine runs so well without one, I didn't want to buy an ignition system. I ended up with a homemade muffler that my friend Russ Pribanic and I built of stainless steel and copper water-pipe fittings. The muffler can is mounted on the firewall and is connected to the exhaust header with a silicone exhaust coupler. It isn't very pretty, but it's functional.

Before you build the Chipmunk (or any other scale model, for that matter), decide which engine you'll use and check out which mufflers—if any—are available for it. For the Chipmunk, you could use an O.S.* or Y.S.* 1.20, a Saito* 1.50, or a SuperTigre* 2500 for power.

COVERING AND COMPLETION

The fiberglass cowl is translucent, so it's easy to see the firewall right through the weave. This facilitates the drilling of the mounting holes in the correct positions. I used eight Du-Bro* pan-head screws to attach the cowl, which I painted with Coverite's* 21st Century spray paint.

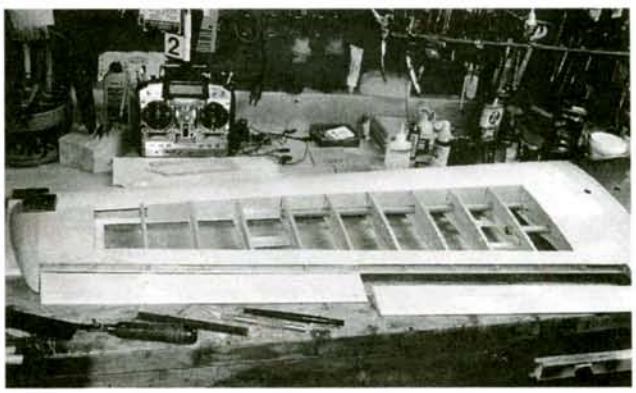
I cleaned the canopy with a tack cloth and masked off the window areas with tape. I painted the canopy with Coverite's 21st Century spray paints. First I misted on two coats of silver and allowed each coat to dry for a couple of minutes. Then I sprayed on six light coats of gloss white. The silver undercoat makes the white more opaque.

I covered the fuselage with 21st Century fabric and film covering. I used fabric on the rudder and elevators and film on the rest of the airframe. The gloss red and white are very close to the colors and finish of the full-size plane. The silver I used on the center section of the wing is close enough to the full-size plane's gray color to satisfy me.

• **Functional landing gear.** To really dress up the Chippy, I installed Robart custom-made Oleo struts. These functional shock-absorbing struts slipped over the wire landing-gear struts that I had cut down in length. Two setscrews hold each one in place, and they really improve the scale appearance of the completed model. An additional benefit is that they greatly improve the model's landing and taxiing performances. I used 4-inch-diameter Du-Bro wheels to complete the landing gear.

CONCLUSION

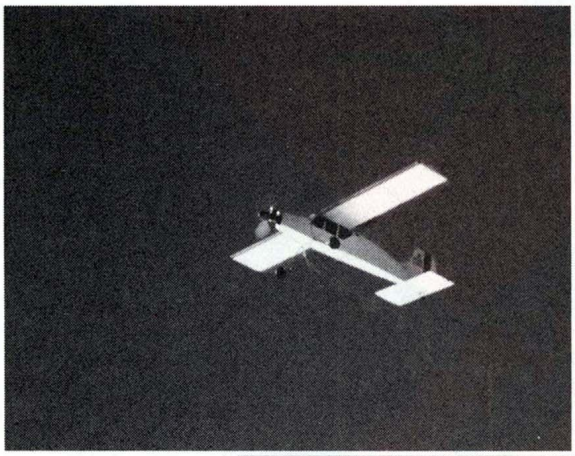
The Ohio R/C Chipmunk is an easy-to-build IMAA-legal model that takes very little time to complete. I finished mine in about 50 hours. Available in three versions, the Chipmunk will appeal to many modelers, all of whom will be pleased with its performance. Whether it's on the front lines of a warbird rally, in the flight box at an aerobatic meet, or simply tearing up the sky at a local club field, the Chippy will satisfy.



Wing construction, though unusual with its use of plywood jig strips to facilitate washout, is fairly easy to do. Here, I have cut the ailerons and flaps free of the left panel.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

by ROY L. CLOUGH JR.



Fold-and-fly fun

The Paper Tiger

IF YOU'RE a newcomer who's just getting comfortable with flipping rudder-and-elevator .049s around the sky while your peripheral vision is registering other guys flying bigger, multi-channel planes, you're probably getting the yen to move up. If so, Paper Tiger is your pussycat.

The jump from mosquito whine to tiger growl can be easier and cheaper than you think. How about more than a 5-foot wingspan, including all airframe structure from firewall to tailwheel, for less than a double sawbuck? How about your choice of high wing or low wing for the trouble of swapping a few rubber bands around? How about a really easy scratch-build that's just about the simplest ever to repair?

Paper Tiger is just big enough and heavy enough to be docile and fast enough to penetrate any wind in which you should be flying. It's well-mannered, whether its wing is high or low. It won't get too far ahead of you while you're learning to handle four channels and will give you a couple of features your .049s probably didn't have: engine control and ground steering.

Paper Tiger's foamboard is light, strong and just about as repairable as you can get. If you poke a hole in it, trim the raw edges and use the hole as a pattern to trace the patch.

Any good .29 will provide enough power to perform mild aerobatics. My original plane (to which five years of revisions, paint and repairs have added nearly ½ pound) will, with an ancient Enya* .29, loop and Immelmann from level flight, roll and do stalls, spins and mild snaps. With the larger Tower* .40, maneuvers are livelier, but the plane still retains all its low-end docility at ½ to ¾ throttle.

SPECIFICATIONS

Name: Paper Tiger

Type: sport/trainer monoplane

Wingspan: 63½ inches

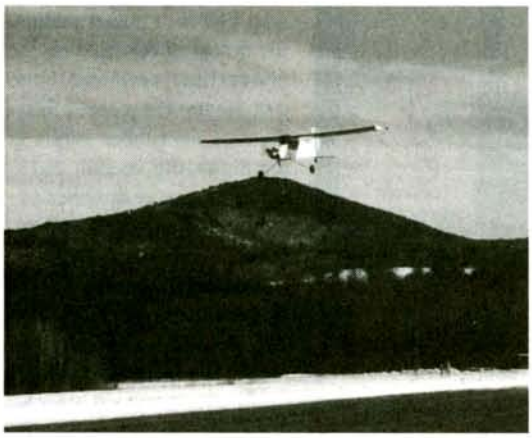
Airfoil: flat-bottom

Radio req'd: 4-channel (rudder, aileron, elevator & throttle)

Engine req'd: .29 to .40 2-stroke

Engine used: Enya .29

Comments: designed by Roy Clough Jr., the Paper Tiger uses inexpensive foamboard for most of its structure. Tail-control-surface hinging is done by notching and creasing the foamboard, while the wing is formed by creasing and folding the foamboard. The Paper Tiger's simple construction makes it a good choice for a first-time builder.



WING CONSTRUCTION

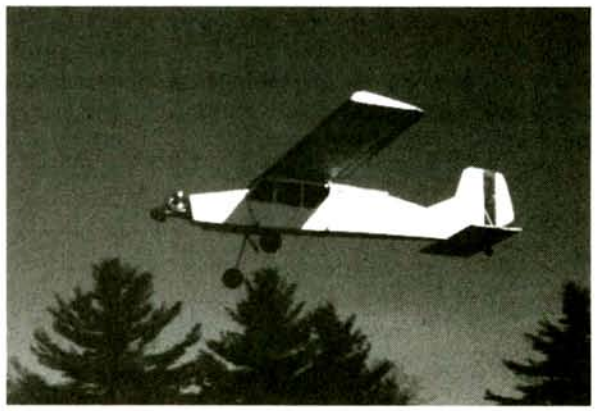
Start with the wing, as it's easier to trim the fuselage cutout to fit the wing than vice versa. Since the actual assembly is a simple fold-up-and-glue process, you might even want to practice on a piece of scrap cardboard.

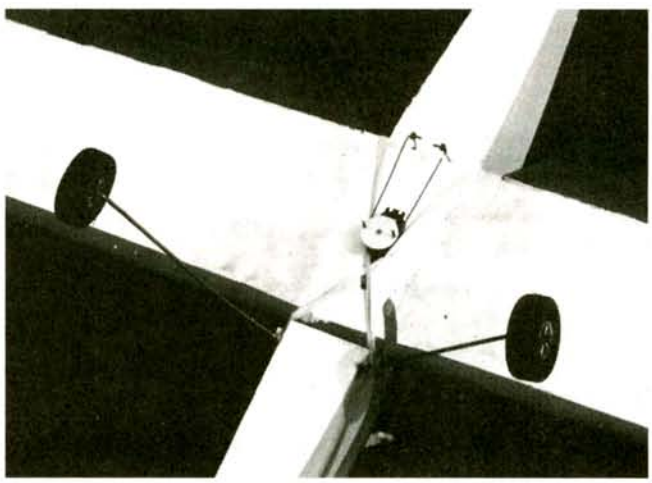
Cut two panels of ⅛-inch (.100) 32x19-inch foamboard. Lay it on a smooth flat surface and with a lead pencil and straightedge, draw in guidelines for scoring on both panels. Use a red pencil for the spar position guideline, which is *not* scored. Score with a blunt-end stylus. Score along the pencil lines deep into the foam but not deeply enough to damage the bottom paper facing. (Tears and cracks through the scored-side paper facing are OK.) Mark and score both panels.

You'll need two airfoil-shaping templates of heavy cardboard or 1/16-inch lite-ply. (Note that there is extra clearance at the trailing edge of these templates.) One slips over the folded-up wing to guide initial squeeze-shaping and the other is open-bottomed for checking the shape during the actual gluing.

Guide the creasing of the wing panels with a straightedge or a metal yardstick. Fold the leading-edge nose score nearly double (90 degrees is enough for the other creases). Use the slip-over template to guide your preliminary hand-squeezing and shaping of each wing panel.

Be careful here to observe right and left. Working on a waxed-paper-covered flat surface, glue a wing spar to the side of the red line nearest the LE on the left panel with 4 inches jutting past the edge that will be joined with its mating panel at the center section. Glue the spar for the right hand panel on the TE side of the red line with the spar projecting a mirror image to mate with the left. This offset allows a simple glue joint instead of overlaid spar doublers after the spars have been tapered to accommodate the small amount of dihedral. When the glue on both spars has set up, fold up the left wing panel and, on a flat work surface, check the airfoil shape with the open-bottom template. Squeeze as much as needed to get it close to the shape you want. Do the right-hand panel. You now have two prebent wing panels ready to assemble into one wing. Glue a strip of ⅛-inch-square balsa to the butt end of the bottom surface of the left-hand panel. This spacer will, as the wing is assembled, produce a slight dihedral. Shave the bottom edges of both spars to allow for this dihedral so the two wing panels will slide together with the spars overlapped and the butt ends of the top and bottom surfaces in contact. Set the right-hand panel aside, open up the creased left-hand panel, and generously coat all the scored grooves and the top of the spar with white glue. Do *not* put any glue on the TE. Fold the upper surface down to the spar, using the open-bottom template to check the shape while you weight down the upper surface. Do the same to the other wing panel and leave at least overnight. Don't worry if the unglued trailing edges aren't quite even. The bottoms of both wings should be reasonably flat but, if they're not quite true, it's no disaster. Run a bead of glue into the TE seam and twist out any unwanted deflection. Weight down until the glue has dried.

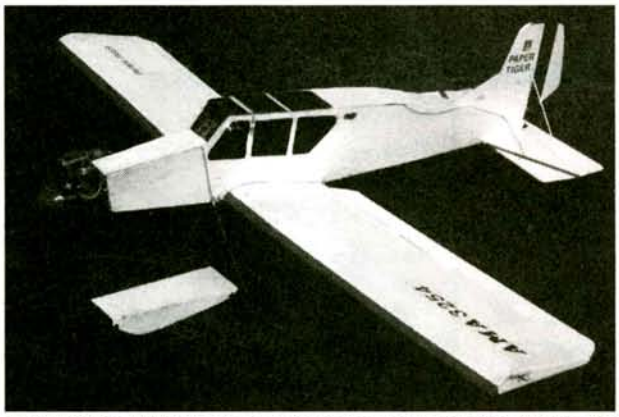


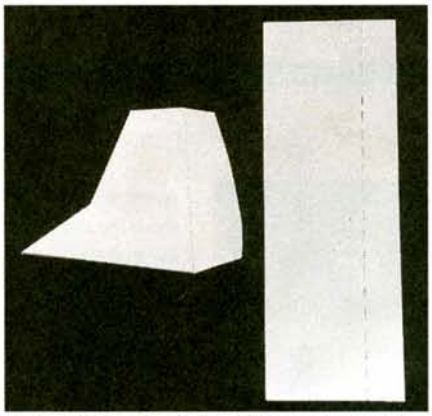


The exposed aileron servo and linkage in the low wing version makes adjustments quick and easy.

ASSEMBLY

Weight down the left wing half on your flat work surface. Prop up the end of the right-hand panel so its bottom edge touches the ⅛-inch balsa shim that's glued to the left panel, and the right panel top surface butts against the left panel top surface in the area between the spars and the trailing edge. (Don't attempt





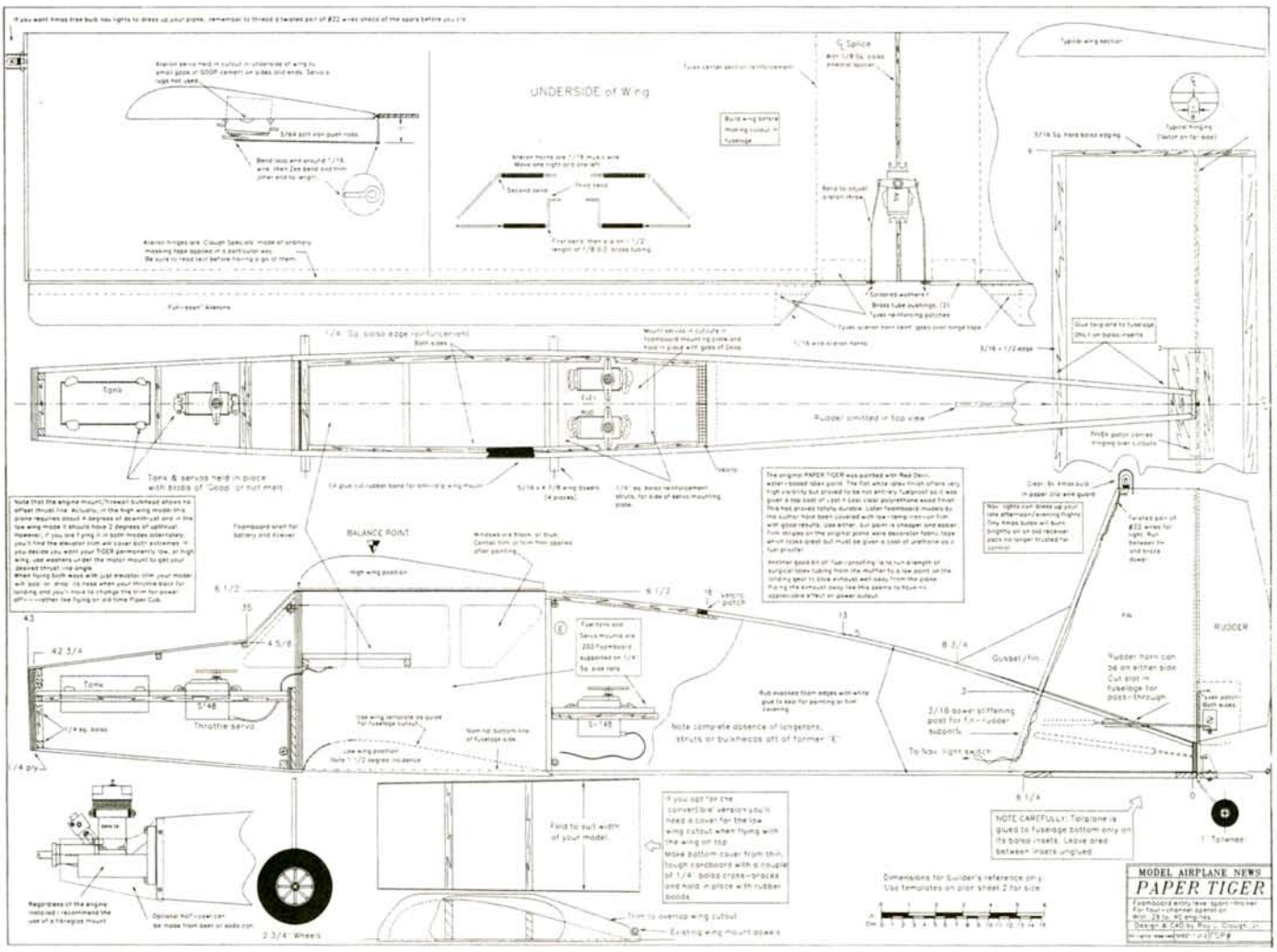
Left: the Paper Tiger can also be set up as a low-wing trainer. (See plans.) Right: the tail feathers cut from foamboard. The hinge lines (shown as dotted lines) are formed by cutting a V notch and creasing the foamboard material.

to bevel the edges for a perfect fit; it's not needed.) There will be a gap on the top side LE ahead of the spars. Ignore it for now. When the fit looks good, pull the wing panels apart enough to apply glue to the mating surfaces of the spars and the ends of the panels where they will touch. Then push the assembly together. Quickly and carefully realign and pin through the foamboard into the spars to hold the wing panels together while the glue sets.

Plans sheet 2 gives exact patterns for fuselage sides, bulkheads, landing-gear bends etc. No patterns are necessary for fuselage top and bottom. Cover them with .100-inch foamboard and trim to shape after the glue has dried. Before painting or covering with film, rub white glue into the exposed foam edges to seal them. The upper front fuselage cover and front window section is covered with stiff cardboard, which is easier to cut away and replace if you ever need to get at the tank or throttle servo. Bulkheads, landing-gear assembly, firewall, etc., are simple and straightforward. (You can skip the cutout for the low-wing position if you'll be happy for now with a high-wing plane. You won't have to bother making the cutout cover used on the convertible version.) Note that the top wing cover hides most of the rubber bands in the high-wing version and is needed to cover the open top when the plane is flown low-wing.

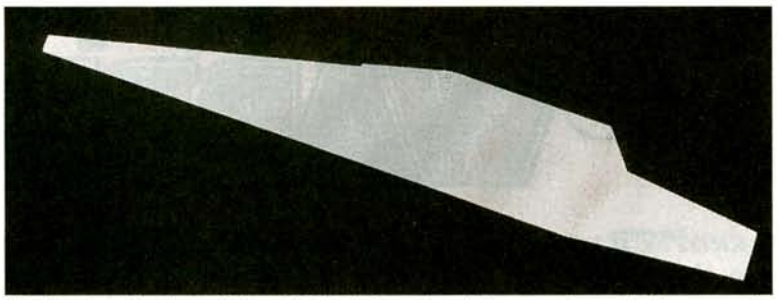
Tail surfaces are edged with 3/16-inch balsa and rounded off with sandpaper. Note the balsa insert in the tailplane (stabilizer). It's there to provide a gluing surface that won't warp the foamboard. Don't omit this. Hinging is done simply with V-grooves cut into the tail surfaces. Paper Tiger's five-year-old paper facing hinges have never failed, but if the idea makes you nervous, stick a strip of freezer tape over the crease.

With a metal straightedge and a very sharp knife, true and trim the glued-together



TO ORDER THE FULL-SIZE PLANS (FSP05971), CALL 1-800-537-5874.

trailing edges of the wing. Cap the open wingtips with 1/4-inch sheet balsa and sand to shape. Fill the gap in the upper top curved edge of the wing with 1/8-inch balsa scrap. Sand it to shape and reinforce the center section with 6-inch-wide Tyvek. There's a trick to this. Start at the top rear of the center section, and you'll see that the Tyvek will lie flat in the shallow dihedral V up to about the location of the spars. After that you must split it to overlap and wrap down around the LE for an inch or so. Then glue on a separate piece to cover the underside back to the TE.



The fuselage is also cut from .200-inch foam-board. Inexpensive and when properly reinforced, very strong.

Aileron attachment is just about the simplest you'll ever see. Start with an 1/8x36-inch hardwood dowel. Rub it all over with candle wax, then hit it with a heat gun until the wax disappears into the wood. Hold the wing down flat. Lay the dowel up against the TE and snug the aileron's LE up against it. Now tape it over with 1-inch-wide freezer tape (or even masking tape). Turn the wing over and remove the dowel, and lay another piece of tape on this side. Push the tacky sides of the tape together and presto!—instant hinging that should outlast the plane.

Engine, tank and radio installation are straightforward. The plane should balance with the components as shown.

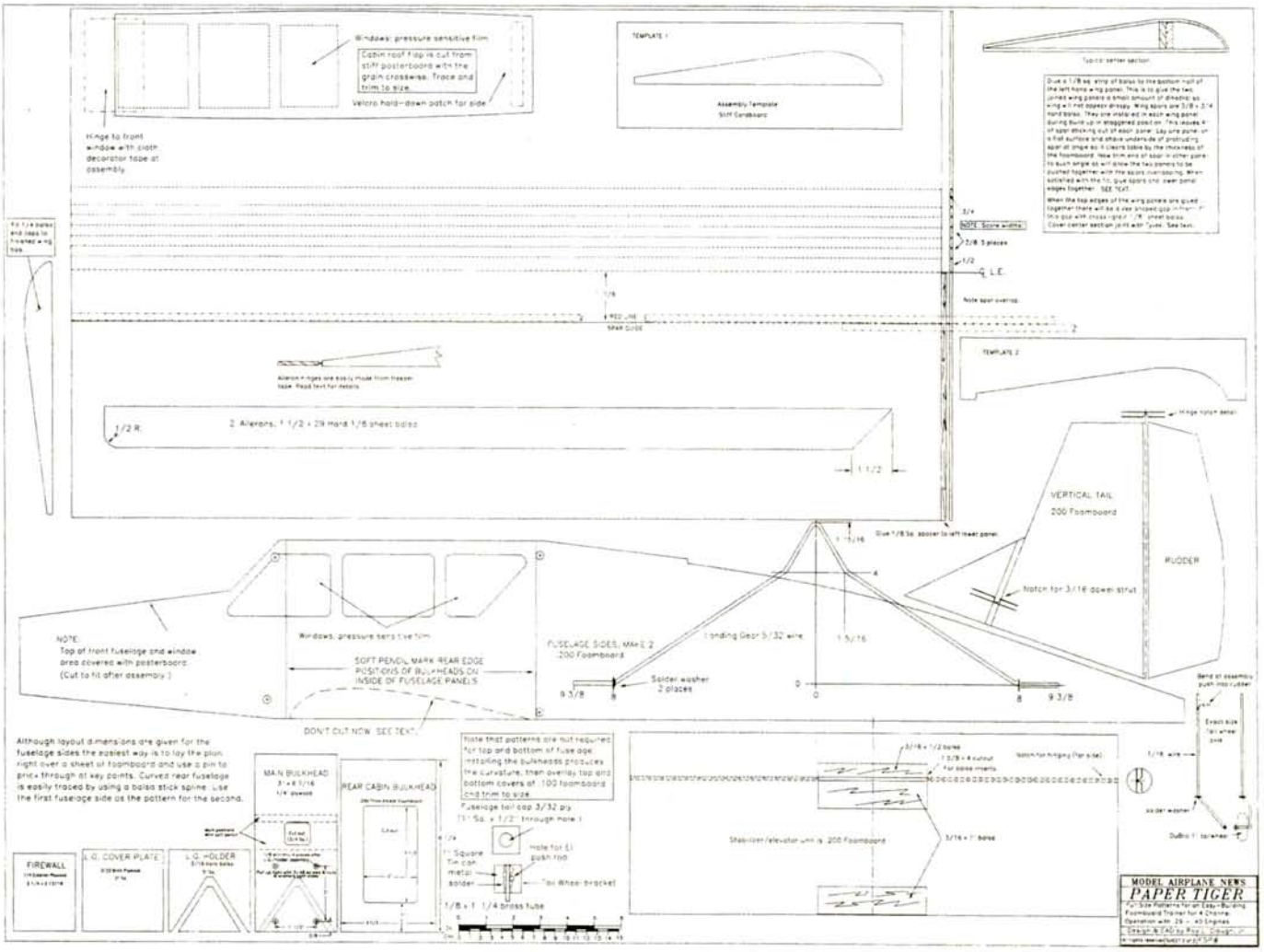
I painted the original Tiger with Red Devil water-based latex, which proved not quite fuelproof. Finally I gave it a top coat of urethane varnish. Experience with later foamboard planes shows low-temp iron-on film works just as well and is faster and easier to apply.

AT THE FIELD

This plane can familiarize you with subtle and not so subtle differences between high- and low-wing control response. It flies well either way, but there is a little more to the conversion than just switching wing locations. You must use trim to compensate for the different positions of the wing relative to the thrust line.

Paper Tiger's capacious insides and high-lift wing give you many radio options. Hint: before ordering your radio, check around the flying site to see which frequencies most of the other chaps use. Get a different number and cut down on impound wait. If you're not superstitious, try channel 13. Few use it. Besides, five years of banging the original Paper Tiger around have proven it is not only easy to build and fly, it's downright lucky.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*



NEWS

FIELD & BENCH REVIEW

Ace R/C Inc.

Tiger Kitten

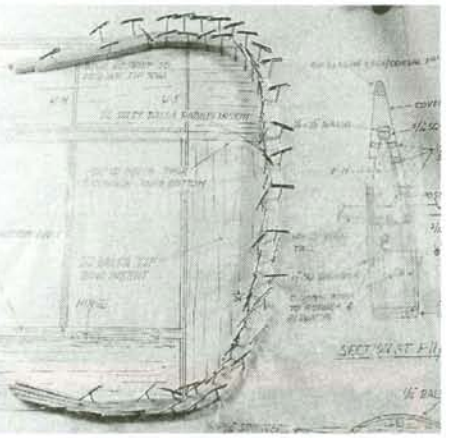
by TIM DIPERI

THE ACE R/C* Tiger Kitten is an all-wood, built-up model airplane kit. Its classic styling along with traditional building techniques offer something fun and interesting for everyone and results in a good flying airplane. I built the electric version of this kit. Since I have very little experience with electric R/C aircraft, I was excited to experience a new aspect of the hobby.

Classic lines and quiet power

When I went through the kit, I found it well-packed with high-quality wood. Also included were nicely molded plastic wheel pants and a one-piece cowl. Building support comes from a well-written instruction manual and full-size plan set. These plans contain a great deal of detailed information regarding assembly and should be reviewed before starting the assembly. The manual is full of good-quality black-and-white photographs that aid the builder considerably.

I will admit I was a bit terrified when I opened the box and saw only wood (I am used to helicopters and ARF airplanes). Once I got started though, I really enjoyed the building process. In fact, I found it very refreshing to find a model that relies on good engineering—not heavy construction—for strength.



Wingtip during the lamination process.

PHOTOS BY DICK TONAN

CONSTRUCTION

This kit is the first model that I have built that requires the builder to laminate much of the curved structure of the airplane. The vertical fin, horizontal stabilizer tips and the two wingtips are all constructed using four pieces of 1/16x1/4-inch balsa glued together.

The classic lines of the Tiger Kitten are evident as she stands proudly on the runway.

This first section took me the longest since the process was new to me. It requires a significant amount of "soaking" time to soften up the wood in warm water. I chose the method of using pins pushed in foam (over the assembly plans) that lined the inner surface of the part to produce sort of a mandrel. Since glue will get on the plans, I put a sheet of wax paper on top of the plans.

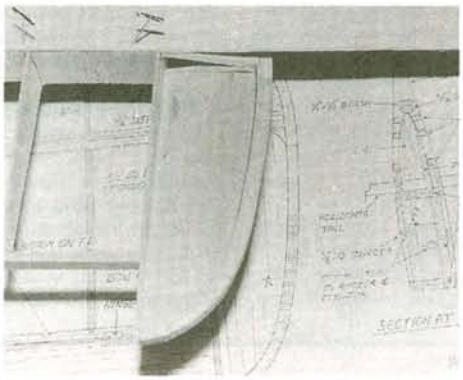
I cut the wood to be a bit longer than I was actually going to need for each part. All four pieces were soaked in hot water for about 20 minutes. Finally, the wood was wrapped around the pins. Subsequent layers were glued to the previous piece, again using pins around the perimeter to hold the structure in place. I found that some of the stringers, included in the kit, did not soften well using water. I wound up making some of my own stringers from some softer sheet balsa. Either way, don't rush this process. Overall, this technique leads to a very light and strong part. Also, it was a lot easier than I had originally thought.

WING

The first major structure to be built was the wing using straightforward building techniques and construction. Two main balsa spars along with a solid leading and trailing edge hold the basic assembly together.

One-sixteenth-inch balsa webbing is glued to the edges of the two spars and on both sides of the spars for strength. I found that the webbing adds a great deal of rigidity to the wing; however, it is important to cut the webbing so it fits closely between the ribs to achieve maximum strength.

Each wing panel was built separately



Upper sheeting and wingtip section. Note good detailing on plans.

and then completed using three plywood joining spar doublers. I used aliphatic-resin glue to do all of the joining. Next, the forward one-third (top/bottom) of the wing is sheeted using 1/16-inch balsa along with the entire center section. Capstrips were glued to the top and bottom of each rib (except for the center section) and the upper and lower trailing edge.

The ailerons were sanded so they would move throughout their travel without binding. Finally, the entire wing was sanded

SPECIFICATIONS

Model: Tiger Kitten

Type: sport

Manufacturer: Ace R/C Inc.

Wingspan: 54 in.

Wing area: 450 sq. in.

Weight: 64.23 oz.

Wing loading: 20.6 oz. per sq. ft.

Length: 38 in.

Motor used: MEC Turbo 10 Plus

Radio req'd: 4-channel (rudder, elevator, throttle, ailerons)

Price: $99.95

Features: the Tiger Kitten is an all-wood kit with classic lines reminiscent of the Golden Age. The kit includes a plastic cowl and wheel pants, preformed landing gear and complete plans and instruction manual.

Comments: in slow flight, the Tiger Kitten is very stable and easy to handle, but it provides sprightly performance when you power up the MEC motor system.

Hits

- Highly detailed plans.
- Good hardware package.
- Easy to fly.

Misses

- Some laminating wood too hard to bend.

FLIGHT PERFORMANCE

After taxiing around a bit to get accustomed to the throttle response, I decided to do a quick circuit. I was really surprised to see how much pep this motor has. In addition, this little model showed very good handling.

• Takeoff and landing

The model does not require full throttle to take off. I used a Master Airscrew* 12x8 wooden (electric) prop. During the takeoff roll, the tail rises smoothly with no down-elevator applied. I made the mistake of not having a little toe-in in the landing gear and found ground handling a bit of a challenge. At full throttle, the airplane accelerates very quickly and will jump into the air at a rather impressive angle of attack. The Tiger Kitten penetrates nicely into the wind. Reducing power slowly, the airplane will settle into a nice descent. A little back-elevator, and the airplane slows down for a nice flare to touchdown.

• High-speed performance

I'll admit, before I flew the Kitten, that I (and many of my friends) believed that electric airplanes and high-speed flight were mutually exclusive. Even flying into a stiff headwind, this airplane really moves. The airplane just goes fast and has good vertical power with the MEC Turbo 10 Plus system.

• Low-speed performance

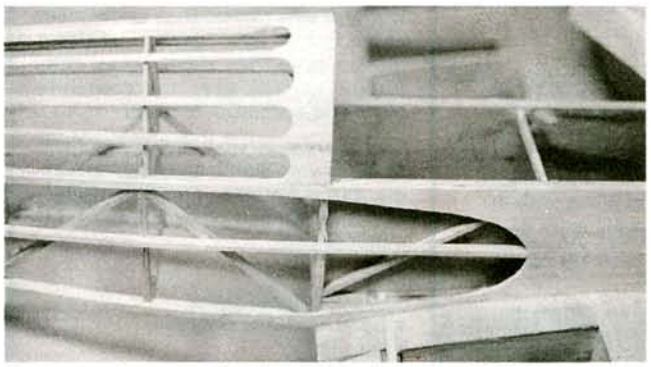
While the model was being photographed, I had to fly some low-speed passes. I deliberately slowed the airplane up and made some steep turns. The ailerons are still very effective at low speeds. The Tiger Kitten doesn't misbehave even at the very low speeds. Stalls are gentle as well, with no tendency to spin. This airplane appears to be engineered with good inherent stability in mind. I would be comfortable letting any beginner pilot fly the airplane.

• Aerobatics

The Tiger Kitten is very aerobatic. It rolls quickly in each direction with very little correction during the inverted portion. Loops are effortless even at partial power. During some stall turns and hammerhead stalls, the airplane behaved very well.

• Flight time performance

I didn't know exactly what flight time to expect, but after the second flight of 4 minutes and 6 minutes of high-speed taxiing to discharge the battery, I was confident that I could comfortably get decent time in the air. During many subsequent flights, I found an increase in flight time and power performance, just as MEC suggests will be the case as the battery becomes conditioned. In fact, unless you insist on flying 100-percent power all of the time, you can easily get 6 to 8 minutes of flying.



Upper, rear formers and stringers form the turtle decking.

smooth. Before finishing the wing, a sheet of (included) Polymat fiberglass was bonded to the center section of the wing for strength. I used CA instead of epoxy in the hopes of saving weight.

FUSELAGE

The basic construction of the fuselage utilizes balsa stringers. Overall, the fuselage can be assembled quite easily when you have all of the parts ready to use. Since there are several different sizes of stringers, all close in size, it was helpful to separate the sizes prior to starting this process.

The two fuselage sides are built over wax paper. The stringers are cut to fit and glued into place. I was a bit confused about the first cross-section past the firewall. I found it very helpful to study the cut-away sketch at each cross-section. When I called Ace for help, they quickly rolled open the plans and aided me. When both sides are complete, a 1/64-inch plywood sheet must be marked and cut out and used for an inside doubler. The sides are then glued to two formers, followed by adding 1/4-inch cross-members to provide the basic structure.

The firewall is mounted, followed by the landing gear mounting plate along with the final two formers. From this point, the rest of the fuselage is erected using balsa upper formers and light stringers. Finally, balsa sheeting is cut to fit the front half of the fuselage for added strength and aesthetic appeal.

The top hatch (which allows access to the motor battery) posed the most difficulty in building for me. The hatch is built on top of a 1/64-inch plywood cutout. This ply is light and strong, but very flexible. Several formers are used on top of this plywood with stringers to yield a nice, large, curved hatch.

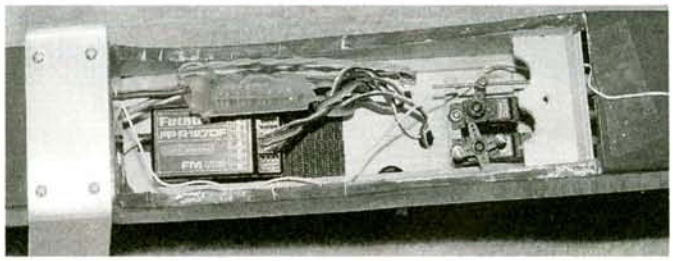
The final "details" of tail mounting and wing installation are quite typical. The tail is simply glued (using epoxy) in place to ensure that it is parallel with the wing. The wing is mounted via two dowels protruding from the leading edge and one bolt near the trailing edge. I chose the Futaba* 9ZHPS with microservos to guide this ship. Since the power package included a battery eliminating system, there was no need to use an additional battery pack.

POWER SYSTEM INSTALLATION

The kit contains instructions for the correct mounting and installation of several electrical motor packages. I used the Turbo 10 Plus Power system from Model Electronics Corp. (MEC)*. The motor mount is built from five pieces of light plywood with fiberglass reinforcements at the seams. The gearbox from the Turbo 10 had to be removed (only two screws) to assemble the mount properly.

The power system is very neat and quiet. In addition, it appears trivial to replace a shaft or gear in the event of a prop strike or crash. I had a few questions regarding this system and called MEC. I have been involved in the hobby for nearly 30 years and have never been as pleasantly surprised by such a well-informed manufacturer. They were very patient and worked me through all of my questions.

The power system came complete with a speed control that plugs directly into my

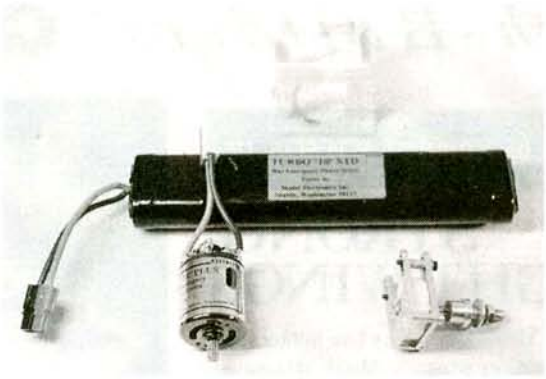


Radio system is accessible through the bottom of the fuselage.

Futaba receiver. After a few minutes of playing with the system, I found it simple to operate and quite reliable with regard to the proportional throttle.

After asking a number of seasoned electric modelers, I chose the Astro-Flight* 110D charger. This charger has a good reputation and is reasonably priced. Best of all, it works well!

For you fellow, new electric modelers, you won't be able to use one of the R/C car chargers for the airplanes since most of them are not capable of charging to the full capacity necessary for good performance. I'd like to give a thank-you to Larry Sribnick, owner of SR Batteries*. He was very helpful with what I should expect during the first few flights.



The Model Electronics motor system is both economical and powerful.

FINISHING

To keep this airplane as light as possible, I used MonoKote* film for all of the balsa surfaces and Top Flite's* matching paint (Lustre Kote) for the plastic parts. The compound curves may present a small challenge to some less experienced modelers, but patience will be rewarded with a good finish.

The cowl and wheel pants had to be painted to match the MonoKote. This is the first time that I tried this paint match system, and I was pleasantly surprised by how well it worked. Take it from me, it's quick and easy.

A note about the wheel pants ... they come as four halves that must be glued together. In addition, the inside center section needed fiberglass reinforcement to reduce the possibility of separation during a hard landing (or two!). This assembly was fairly heavy compared to the effect it has on the airplane. Be sure that you only use the minimum amount of fiberglass tape during this assembly.

WEIGHT EVALUATION ALLOCATION

Since this model should be built as light as possible, I evaluated certain parts as a percentage of overall aircraft weight. The complete, ready-to-fly weight of the Tiger Kitten was 64.23 ounces. This weight is just about the high end of the maximum suggested weight of 65 ounces. For the curious:

- Wing—19 percent
- Landing gear—12 percent
- Battery—31 percent
- Fuselage with radio and motor—38 percent

CONCLUSION

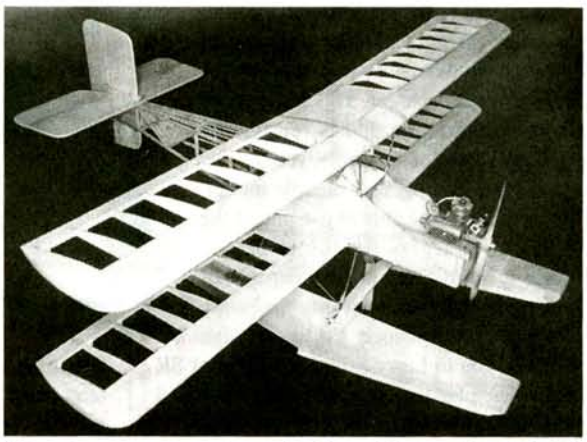
It has been quite some time since an airplane concept has excited me. The kit itself is not designed for a first-time builder. However, the airplane can be comfortably flown by pilots with intermediate skills. Since this is only my second project using an electric-powered aircraft, I can clearly say to my piston-powered colleagues, "Try it; you'll like it!"

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.* ✦

Scratch-Builders' CORNER

by GEORGE WILSON JR.

STRONG, LIGHT WINGS



The wings on my sorta-scale Consolidated PT-1 (Model Builder, May '84) have solid tips, LE D-tube and solid TEs. Without interplane struts, the wings performed very well for the draggy PT-1. Its engine is exposed for maintenance (just as in the full-scale).

MOST SCRATCH-builders have favorite types of wing construction, and most are like me: we never build a wing that's exactly the same as any previous one. This article addresses the construction of sport and trainer wings for .10- to .60-size models. Wings are possibly the most important part of a model airplane from a flight-performance standpoint. Therefore, give them a lot of thought. The principles covered apply to larger and smaller models.

SOME POINTS TO CONSIDER

- Select wood sizes to match the model's size.
- Use lighter stock. Most wings are stronger than they need to be.
- Obtain strength by proper design, not by oversizing the lumber.

There are two principal strength concerns in wing design: first, bending spanwise, and second, twisting chordwise. Neither of these is forbidden as we see gliders being towed up with wings bent into curves because of pressure on their undersides. Similarly, free-flight endurance model wings twist as the model spirals upward and fights to gain altitude. Well-designed wings accept this type of distortion without fracturing. Most sport/trainer models are designed with relatively rigid wings. This simplifies their design and construction.

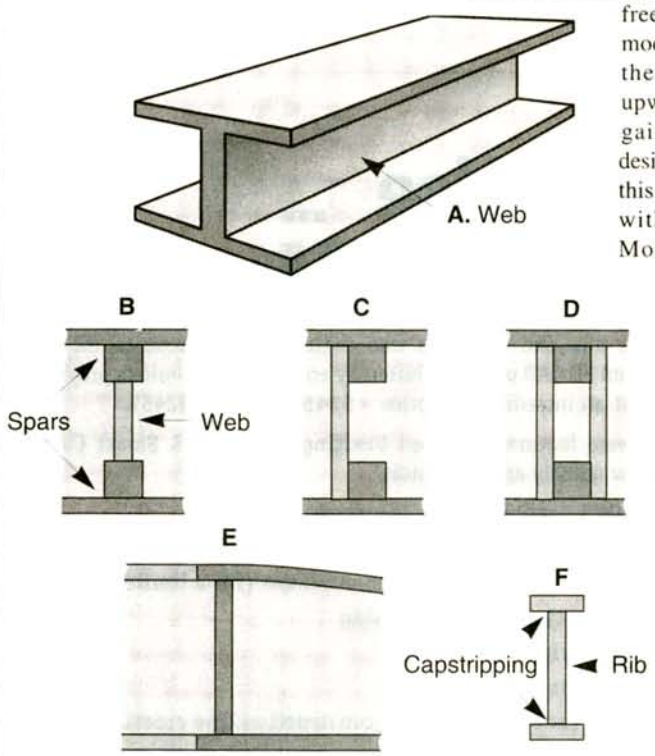


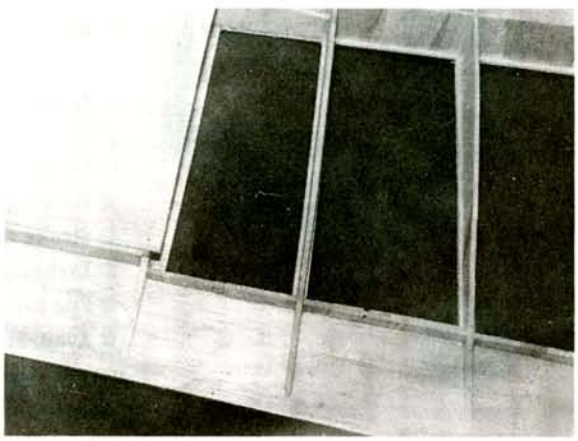
Figure 1. I-beam spars

A. shows a classical metal I-beam used to construct buildings, bridges, cranes and airplanes. Figures B through D are cross-sections of typical built-up spars with webbing added between the ribs. B is similar to the classical I-beam. Figures C and D are easier to construct using webs attached to the sides of the top and bottom spars. With webs on both sides, the spars becomes a "box beam" as shown in Figure D. The top and bottom spars are often made of spruce when extra strength is needed. Figure E uses a full-depth spar. The ribs are made in two pieces, and the wing sheeting acts as the top and bottom members of the I-beam. This design is very strong because the beam has a continuous web and the top and bottom are far apart. Figure F shows a cross-section of a capstripped rib. It, too, has the an I-beam form.

STRENGTH AND WEIGHT CONSIDERATIONS

• **Strength**. This is the most important construction feature. It can be achieved without undue weight by using I-beam-type spars and D-tube (stressed skin) type construction. (It is called "D-tube" because the wing's front cross-section is shaped like the letter D.) These construction techniques take many forms. In fact, even the wing covering contributes to the I-beam nature of many spars.

• **Stress**. In a wing spar, stress is maximum at its center and tapers to zero at the wingtip. Also, if the wing's planform or thickness varies, stress does not vary uniformly along the spar's length. Ideally, a wing spar may be tapered toward the wingtip to save



A large, double D-tube wing under construction. Note that the forward webbing is pieced from scrap balsa. After the top TE sheeting had been added, installation of the capstrips completed the wing.

weight, but construction becomes difficult. Bear in mind that most in-flight wing failures are ruptures at or near the dihedral joint (or joints, in polyhedral wings).

• **Weight**. This is always a prime consideration: light models always fly best. Good design can achieve strength with lightness. The fact that sheet wood can be bent easily across its width and with difficulty across its thickness is the key to strong wing design. Typically, thin plywood braces add great strength at the dihedral joints. Ribs are strong chordwise but weak spanwise. Luckily, they need little strength spanwise.

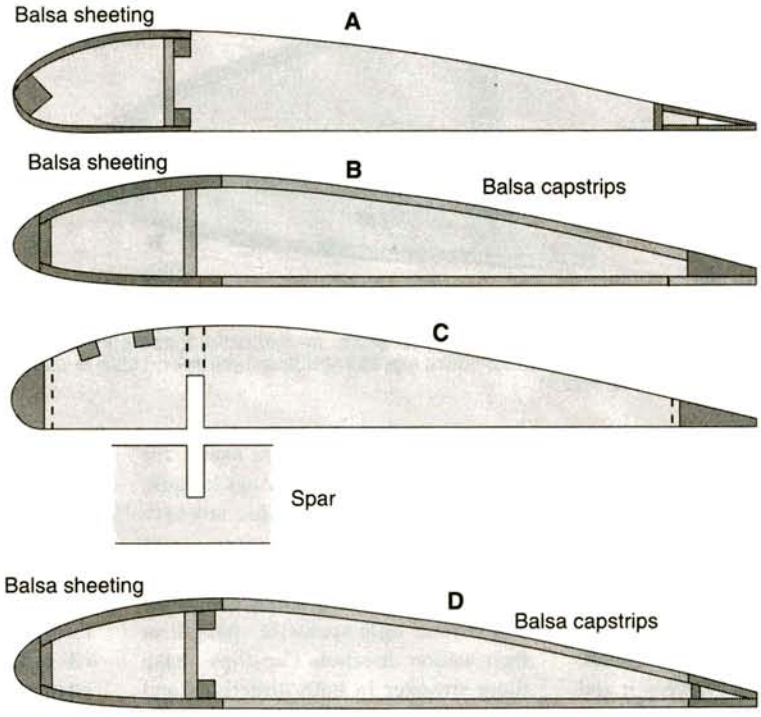


Figure 2. Rib layouts

This shows four of the many possible rib layouts. Figure A is similar to those found in many kits where the ribs are die-cut or laser-cut. It uses typical D-tube construction at both the LE and TE and, as a result, is very strong. Figure B shows a type of construction that is strong and easily scratch-built. The ribs are in two pieces and the spar is full-depth. The combination of the full-depth spar and the LE sheeting forms an I-beam with a continuous web. Figure C is a lightweight simple design that was once very popular—so-called "egg-crate" construction. The spar and ribs are notched to fit into one another. Notched LEs and TEs are recommended. Use of turbulator spars will make this type of wing more resistant to twisting forces. Figure D shows a strong D-tube design that uses an upper and lower spar that can be of spruce if extra strength is necessary.

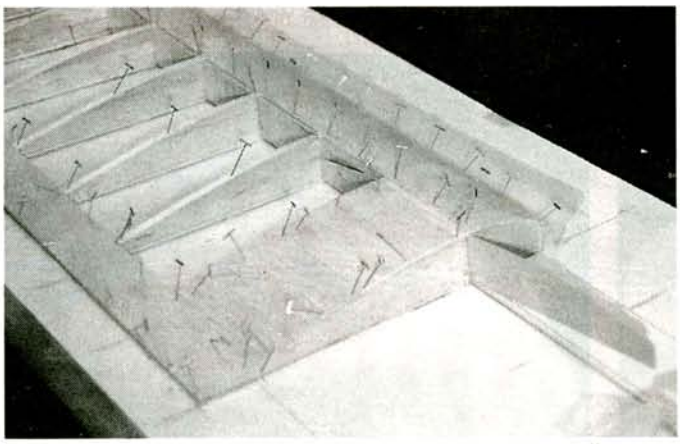
• **Building ease**. This is another consideration. As model designs have progressed over the years, they have become simpler and easier to build; so it is with wings. The most frequently used technique is D-tube, which is easy to build, strong and relatively light (see Figures 2 and 3).

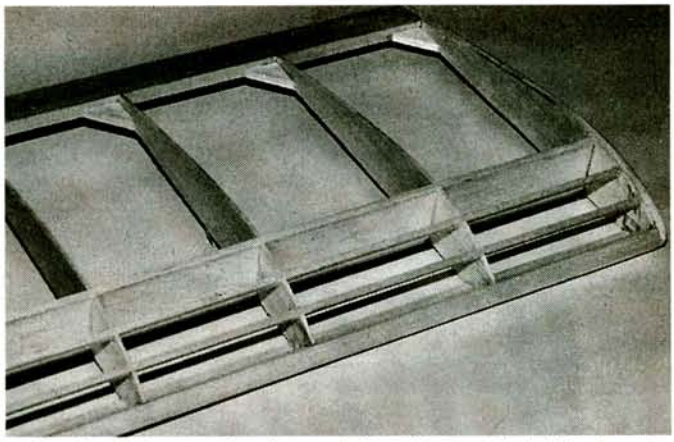
If you are building a wing with precut foam-cores, construction is easy once you have learned the skill of applying wing sheeting. However, do not make the mistake of assuming that warps can not be built into foam-core wings. Follow the instructions for building the wing carefully. Use the foam bed and a flat surface to check flatness as you go along. You can remove warps from foam wings with heat and perseverance, but it isn't easy.

Appearance is affected if you sheet the entire wing (built-up or foam-core). Many of us like to see the framing showing through the covering, or even to see the framework itself through transparent covering. The covering adds strength as well as good looks. Choose it well. Some covering materials look great but tend to shatter in even minor crashes. Micafilm by Coverite* looks good, adds great strength and only a little weight. It is widely used for the long, thin wings used on gliders.

CONSTRUCTION TECHNIQUES

It is true that there is little new in this world; mostly, we combine or rework old ideas. As an exercise I listed over a dozen, typical, wing-construction techniques. Considering the possible combinations of spars, leading edges (LE) and trailing edges (TE), etc., that are possible, the list could go on and on. The material that follows addresses some of the





Left: this wing panel is being built over a set of bare minimum lines, not over the plan. This saves the plans and allows the scratch-builder to make changes. The dihedral brace is 1/16-inch plywood that is very strong across its thickness. The wing is double D-tubed (both LE and TE). If you look carefully, you will see that the ribs are made of scrap balsa pieces that have been glued together. Right: this is the light, simple wing of my Litestik Junior. It uses a full-depth spar, two-piece ribs and turbulator spars to add twist and spanwise bend resistance. The wing is quite strong and rigid.

most commonly used techniques.

• **Spars.** The most practical way to ensure that spars are strong and light is to build them as I-beams. There are many variations on the way model spar beams can be built; some are shown in Figure 1. The strongest I-beams are those with continuous webs. However, many models use interrupted webs—vertical-grain webs are added between the ribs.

The closer the spars come to being full depth, the more they will resist spanwise bending. The simplest approach is a sheet-wood spar that uses the top and bottom sheeting to make it into an I-beam configuration.

Larger wings sometimes use a main spar with a smaller spar between it and the TE. If D-tube wing construction is used, the need for two spars in wings for .60-size and smaller models is questionable. Double spars are useful for fabric-covered full-scale wings because the fabric does not provide strength equivalent to D-tube construction in models.

Ribs are inherently strong chordwise and require little spanwise strength in their weaker direction. Capstrips make them stronger in both directions and add to the finished wing's appearance (Figure 1F). There are endless ways to configure ribs; Figure 2 shows four popular variations. Ribs can be made of 1/16-inch medium balsa for .25- to .60-size wings and 1/32-inch balsa for smaller wings.

D-tube construction is recommended for all sport/trainer wings. This calls for sheeting the top and bottom from the main spar forward and, for large wings, sheeting at the TE. Shear webbing is required between the top and bottom spars and in front of the TE if it is to be D-tubed.

Figure 3 is a cross-section of a typical D-tube wing. The spar and ribs are first assembled on the building board over the bottom capstrips and sheeting. Bevel the sub-LE and install it. Dampen the bottom sheeting and glue it to the rib bottoms and sub-LE. A piece of strip wood under the front edge will help. Dampen the top sheeting and glue it into place. Sand the sheeting flush with the sub-LE. Add the roughly shaped

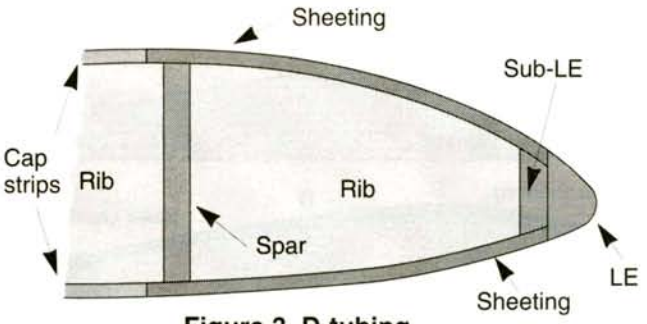
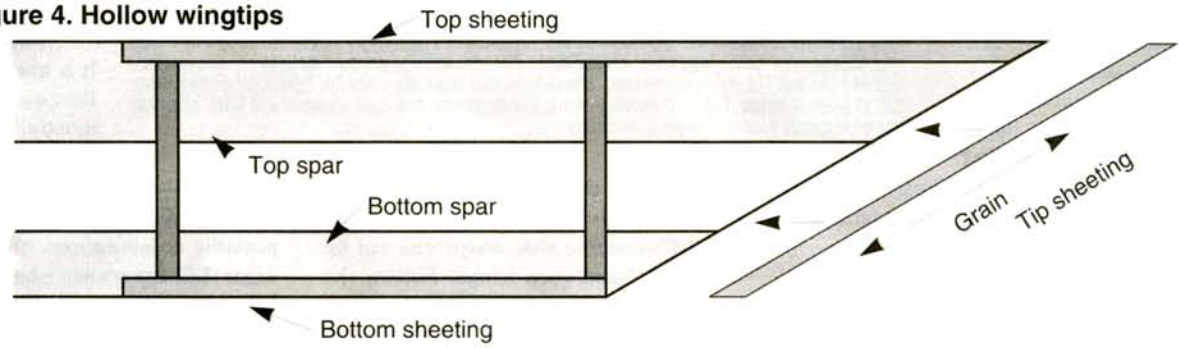


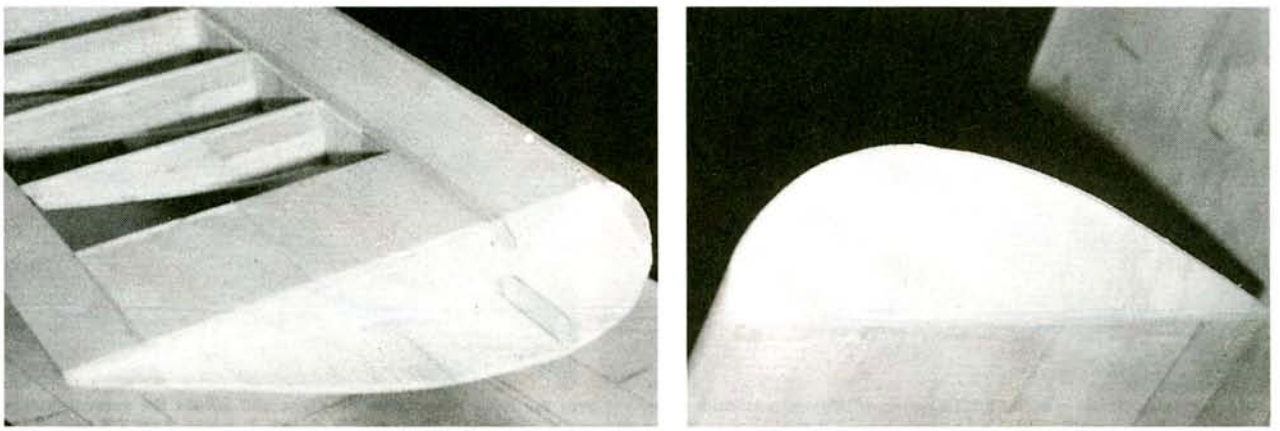
Figure 3. D-tubing

This is a recommended D-tube design. The construction sequence is described in the text. The sub-leading edge adds strength and also makes it easier to install the sheeting.

Figure 4. Hollow wingtips



This is a section of a hollow wingtip looking forward. The construction sequence is described in the text. This type of tip is light and not difficult to build.



Left: hollow wingtips are strong and not hard to build (see text). Here, the tip bottom has been sanded flat prior to sheeting. Triangular supports can be added, but on small wings, they are not needed. Note the pieced ribs. Once the wing has been covered, only you and I will know it was pieced together of scrap. Right: this is the finished hollow tip. Note that the grain of the sheeting runs spanwise. Repairs are easy: square up the damaged section, fill it with an oversize block/piece of balsa, sand and finish to match.

LE, install the top capstrips and TE, and finish the wing as usual. This building sequence allows the use of untrimmed sheeting. Matching sheeting to the LE after it has been installed can be difficult.

Next time you build a wing panel, take the time to check its strength as it is built. It will have to be removed from the building board to do this. With the spars(s), LE and TE in place, try bending the wing spanwise and twisting it chordwise. Add the sheeting and do the bend/twist tests again. And, finally, repeat them when the wing has been covered and finished. If you haven't done these tests before, I guarantee that you will be impressed. A D-tube wing has been described as being as stiff as a 2x10 board.

Incidentally, if you want washout in a D-tube wing panel, make sure you build it in; raise the TE at the tip during construction. More flexible wings can have washout warped in with heat. The amount of washout is not very critical: ¼ inch to ½ inch under the TE of the tip of a .40-size model will help prevent tip-stalling. Most important, avoid anything close to washin, for it will cause the wingtips to stall at slow speeds (read "When landing").

• **Wingtips** can easily be carved from balsa using a knife, block plane and sandpaper (60-grit for shaping and 120-grit or finer for finishing). If you haven't done it, try it; you will be surprised at how good you are at wood carving. Do use soft balsa. If the kit came with hard balsa, save it for another use. Soft balsa will absorb a bump caused by a rough landing. Repairs are easy.

Some of us prefer hollow wingtips. They are lighter (the last place you need extra weight is far from the CG); they "build" easily once you make the decision to go with them. Here's how (see Figure 4): sheet at least the outer tip-bay top and bottom, and extend the top sheeting, the LE and the TE to make the wingtip sheeted area long enough to be trimmed roughly to the tip's plan view. Add a piece at the bottom of the outer rib to provide extra gluing surface for the tip sheeting. Sand the tip bottom flat (60-grit sandpaper) using a large sanding block (say, 3x12 inches) or use one of Great Plane's* Easy Touch Bar Sanders. The shape of the tip may change somewhat as you sand. This is not important. Once the tip is flat, two or three triangular tip-support ribs can be installed if you want added tip strength. The tip sheeting can be medium to hard with its grain running spanwise. Sand and finish as required. Hollow wingtips are repaired in the same way as solid tips are: square up the damaged area with a knife, glue in an oversize piece of balsa, sand to shape and finish it.

A FAVORITE WING

Not long ago, I lucked in to a Live Wire Champion kit (circa 1979) at a garage sale and decided to build it. I changed the dihedral to about 2 degrees each side, installed trike gear, lowered the engine mount to neatly accommodate an O.S.* 25 and modified the wing so I could bolt it on. As predicted, the Champ flies very well. It is another argument for smaller lower-power trainers.

Hal deBolt used my favorite type of wing construction for his Champ—a full-depth spar with two-piece ribs, D-tube LE and hollow wingtips. Even with 4-inch rib spacing, this 54-inch wing is very strong. It is also light, easy to build and looks good. What more can you ask for?

LOST AND FOUND DEPARTMENT

When writing my column on woods (July '96), my file refused to come up with an excellent reference article on balsa. I recently rediscovered it and it's Bob Meuser's article on page 42 of the June 1976 issue of *Model Aviation*. It leaves little untold about our favorite wood and should be read by all serious scratch-builders.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.* ✦

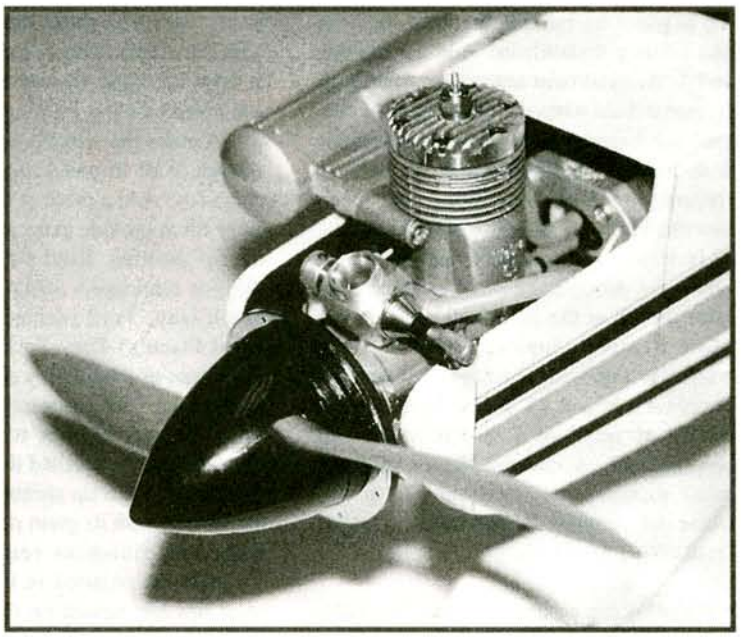
MODEL AIRPLANE NEWS
PRODUCT REVIEW

SULLIVAN PRODUCTS

Genesys

In-flight generator system

by DAVE GIERKE

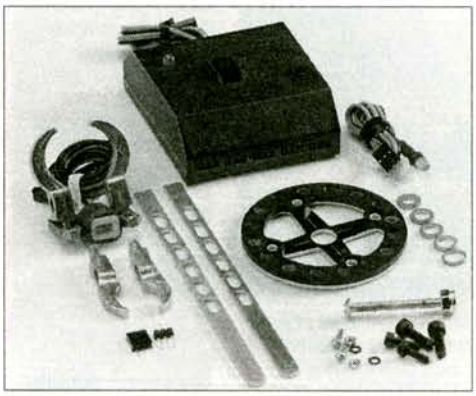


DAVE GIERKE & WALTER SIDAS

The Genesys system installed on a Webra .40 Silverline.

AS TEENAGERS, we often flew control-line after dark. At midnight on December 31, members of the Aerobats (North Tonawanda, NY) were always in the air; "First to fly" was our New Year's resolution.

It was usually more fun to fly when you could see the airplane, so we mounted grain-of-wheat bulbs to the wingtips and vertical fin. To increase the brightness, some tried flashlight bulbs. Unfortunately, these required big, heavy cells that diminished the model's flight performance. The battery—*any battery*—was the shortcoming of the system; consisting of non-rechargeable AA-size dry-cells, it often didn't survive a single flying session. As old-timers know, rechargeable Ni-Cd cells weren't available to the modeling community until the early '60s.



In-Flight Power System (base unit); all components shown (S660).

Then the possibility of on-board battery charging became a reality. Over the years, several one-of-a-kind systems have been developed by experts such as Maynard Hill (for his record-breaking R/C endurance models). Now, Sullivan Products* has produced Genesys, the on-board generator system for model engines.

Genesys can provide conditioned electrical power for any on-board application requiring 4.8 or 6 volts, up to about 750mA (direct current). System options include:

- Running the on-board radio receiver and servos while recharging flight-pack batteries
- Operating only the system accessories, e.g., navigation lights.
- Recharging a separate battery pack.

While the system can supply ample power for all of these options, Sullivan engineers suggest "Never operate the model without a battery pack either attached to the CCU (Central Control Unit) or attached to the receiver," and they warn, "Always be sure there is enough charge in the battery to land the model if the engine stops." Remember, if the engine stops, the generator can't supply electricity! As a fail-safe feature, the CCU connects the primary battery port directly to the radio to provide power in case the engine stops or any part of the system becomes disabled.

The maximum system output depends on engine speed. My test of Genesys closely confirmed the current versus rpm graph provided by the factory (see Figure 1). The system provided from 90mA at 4,000rpm to 750mA at 15,000rpm. Depending on the flight batteries' state of charge, the charge rate can vary from 200mA (maximum) to below 5mA; charging current decreases as battery voltage increases. The LED

(charge indicator) will turn off when the charging current drops below 5mA, indicating fully charged batteries.

Sullivan suggests that, "Your receiver and servos need an average of 100 to 250mA, depending on model, size and activity of the servos. An average receiver and servos will draw about 70mA at rest; each servo can draw 150mA or more when exerting a large force. Remaining capacity can be used for accessories."

Engine rpm are reduced proportionally to the load on the generator. I measured generator current by cutting one of the wires leading from the transformer (induction coil) and inserting an ammeter. I used a well-broken-in Enya .60XF 2-stroke engine for test purposes. It slowed by about 300rpm at wide-open throttle, at full generator load. Some engine power is sacrificed to run the system, but the loss is minimal compared to the benefits.

SPECIFICATIONS

Name: Genesys In-Flight Power System

Type: Onboard accessories

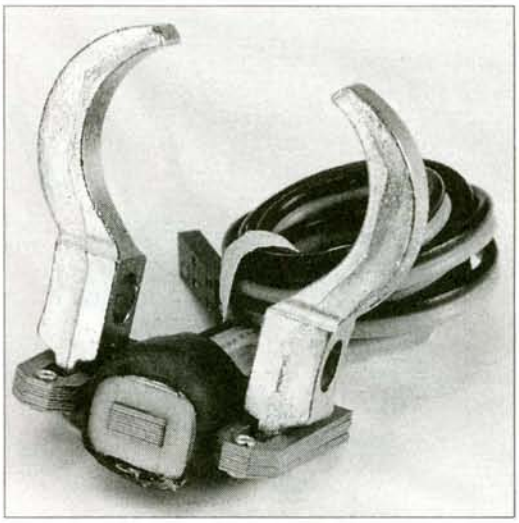
Manufacturer: Sullivan Products

List Price:
- In-Flight Power System (base unit)—S660, $89.95.
- Navigation lights—S665, $29.95.
- Rotating beacon (simulated)—S663, $29.95.
- Strobe light (simulated)—S662, $24.95.
- Radio-operated switch—S664, $29.95.
- Landing lights with R/C switch (future offering)—S667, approximately $40.

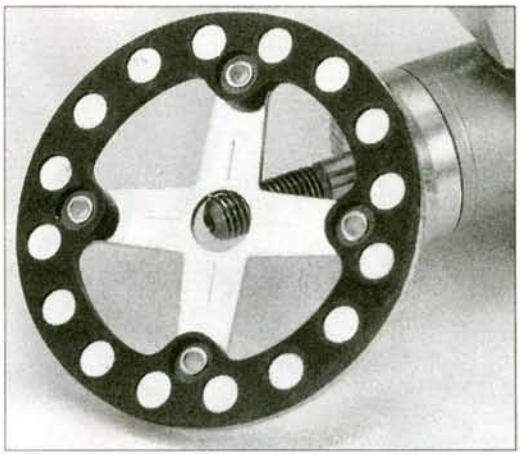
Comments: the Genesys provides R/C flyers with a new set of possibilities for providing power to a host of in-flight accessories. Sullivan's range of lights and beacons will help any model come alive.

Hits
- Excellent design.
- Many quality components.
- Complete and professionally packaged units.
- Excellent operation.

Misses
- Lack of prop driver serrations and non-recessed rivet heads on the front of the magnet ring.
- Plugs are too loose in their sockets on the CCU. Shouldn't need glue or tape to ensure reliable connections.



Transformer assembly with large clamps.



Magnet ring viewed from the rear; contains 16 rare-earth permanent magnets.

IN-FLIGHT POWER SYSTEM

The heart of Genesys is its in-flight power system. Sold as a package, it consists of CCU, transformer, magnet ring, large and small clamps, back straps and assorted hardware. The transformer must be mounted rigidly and accurately to the engine. Its position relative to the magnet ring is very important in terms of generating power and represents the only real challenge to the assembly of the system. Everything else is done for you.

INSTALLATION

• **Magnet ring**. After removing the engine from the model, strip everything from the propeller shaft. Attach the magnet ring to the shaft with the 16 magnets facing the engine. The hole in the magnet ring is 0.375 inch and requires a spacer washer matched to your engine. Sullivan includes metal spacers—a nice touch compared to the plastic spacers provided by some spinner manufacturers.

Replace the spinner and/or propeller and tighten securely. This isn't as easy as it sounds. The front side of the magnet ring, which now acts as the drive washer for the propeller, doesn't have a serrated surface; therefore, it doesn't give the propeller any "bite" when tightening; wooden props proved most difficult to secure without slipping.

If a backplate-equipped spinner is employed—1.750 inch or larger—it will rest on four raised brass rivet heads used to assemble the magnet ring. Inadvertently, this distances the center of the backplate away from the magnet ring. If the propeller were tightened in this

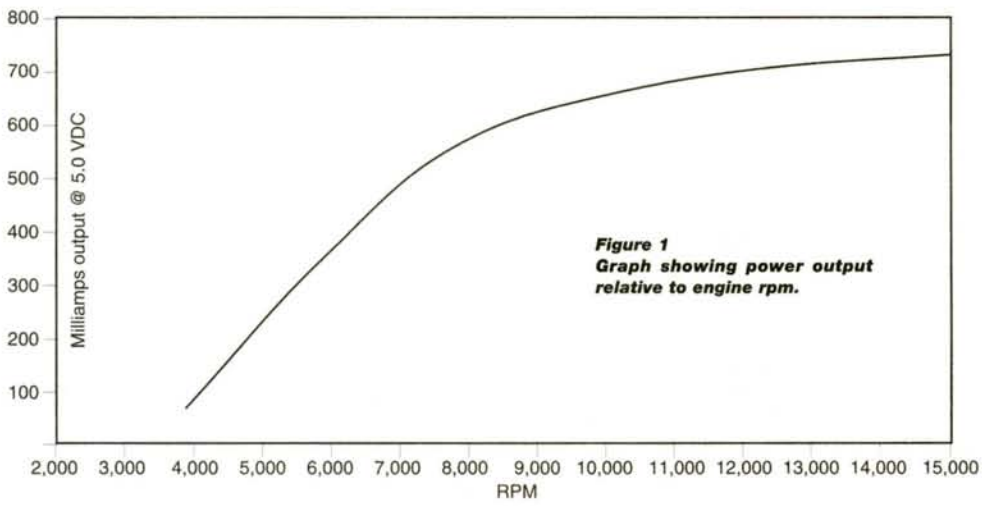
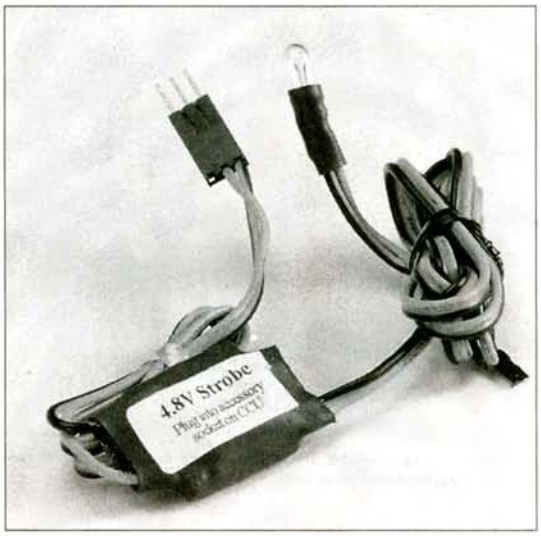


Figure 1
Graph showing power output relative to engine rpm.

The 4.8V navigation lights accessory—red, white and green (S665).



The 4.8V strobe-light accessory—simulated; a bright incandescent bulb (S662).

configuration, the assembly would bend. To fix the problem: 1. Mark the rivet locations on the rear of the backplate with carbon paper; 2. Center punch; 3. Using a drill press, drill the backplate to clear the rivets; 4. Re-balance the backplate. Another potential solution would be to fit a machined aluminum washer between the magnet ring and spinner backplate.

If you plan to use the generator on an airplane with a cowl having a spinner diameter of less than 2.5 inches, the magnet ring will protrude at the circumference. Also, there might not be enough room for the transformer. For sport models, these may be minor, easily resolved problems. On the other hand, scale models might be savaged by such intrusions. Aesthetically, I believe the system looks best with spinners of 2.5 inches diameter and larger.

• **Transformer**. Select a pair of clamps for the transformer. The small clamps will fit front engine housings of 0.600 to 0.950 inch diameter. The larger clamps work for housings 0.950 to 1.370 inch diameter. The larger clamps were perfect for the Enya.

First, insert the foot of each clamp through corresponding slots in the transformer core. Next, position the clamps around the engine housing. At this point, be sure the open end of the core (E-shaped) faces the magnet ring. This assembly will stick to the magnets, which is good; nothing falls apart. Next, the 8-32 bolt is slid through the clamps where a locknut is left just a bit loose as a small amount of transformer movement must be allowed for final adjustment.

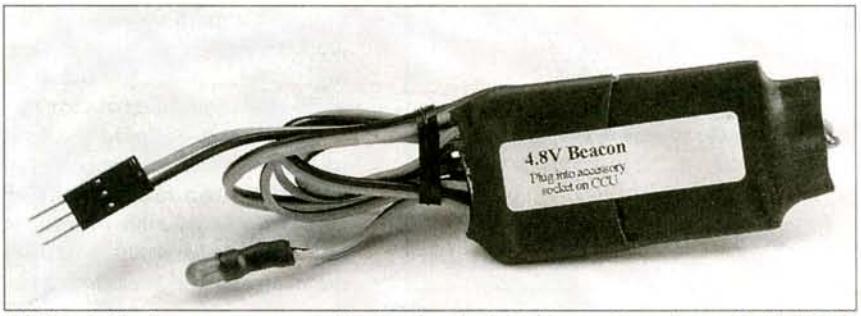
The transformer must be properly spaced from the magnet ring. Sullivan engineers say the system will work fine with a gap of 0.005 to 0.035 inch. "The closer the transformer is to the magnets," they claim, "the better the low-rpm output." They suggest using *three thicknesses* of the instruction sheet for a spacer—about 0.012 inch.

Following reassembly, I decided to add a step. To prevent assembly movement and guarantee perfect alignment while installing the back straps, I lightly C-clamped the iron core of the transformer and the spacer to the magnet ring. Don't place the clamp on the *wire coil*; this would probably ruin it.

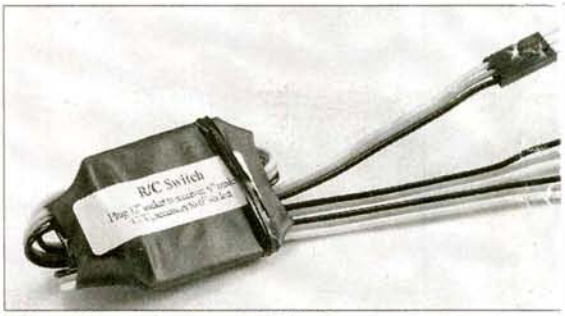
The back straps are important. They prevent the transformer from moving into the rotating magnet ring if the clamp bolt loosens. They also help maintain the gap. The two soft aluminum straps are bolted (2-56 bolts) to the rear of the transformer core and the engine's lower backplate holes with existing machine screws. A flat washer was placed under the head of each back plate screw so they wouldn't chew up the straps when tightened. Subsequent to securing these screws, the clamping screw was torqued to complete the assembly. After removing the 0.008-inch spacer. the entire unit was found to be very rigid. When cranking the engine over by hand, you can feel the "bumps" as the magnets passes the transformer core. Make sure they don't touch. Later, with the engine operating at idle, the generator produced a turbine-like whine.

• **Central Control Unit (CCU)**. The CCU provides current to your radio system and to Genesys accessories, and it regulates current to the main battery. Charging is indicated by the green LED on top of the CCU. If an external charge indicator is desired, "... glue the remote LED charging indicator (included) in a visible place on the model," suggests Sullivan, "and plug the connector into the top port marked 'Remote Indicator'." When the generator is charging the main battery, both LEDs will light. A slide switch on the top of the CCU is positioned for either 4.8V or 6V operation.

The CCU has five accessory sockets

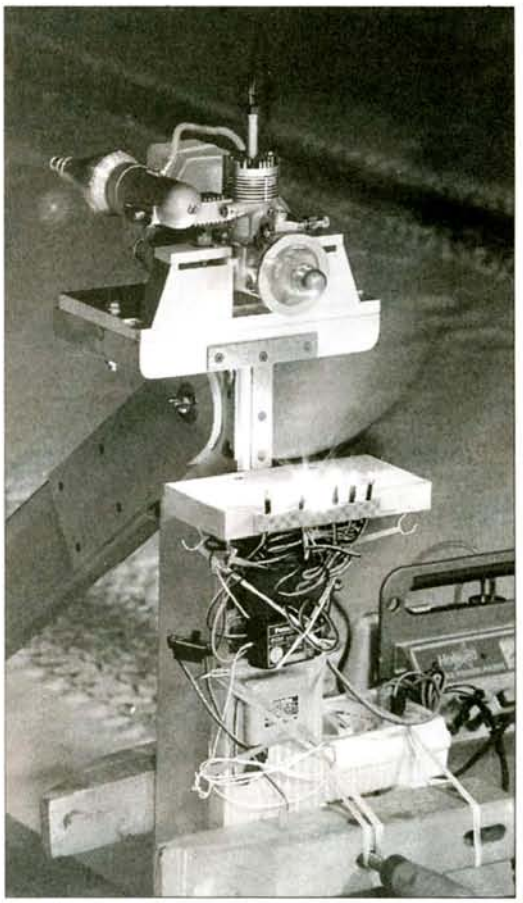


A 4.8V rotating-beacon accessory—simulated; a slowly flashing red incandescent bulb (S663).



R/C switch; controls an individual accessory from the transmitter.

In-flight power system with navigation lights accessory and test battery; Enya .60XF-4 G8 (ringed) test engine.

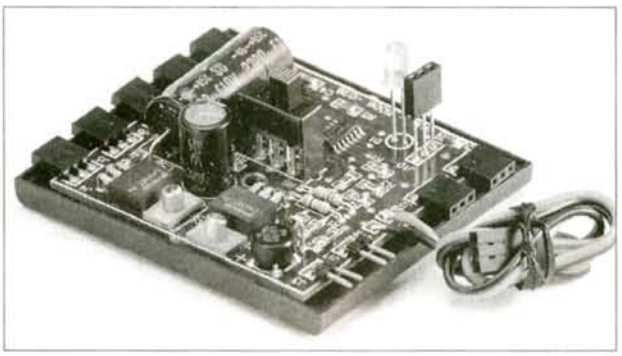


This image of the Genesys was taken after dark with time-lapse photography. The only illumination was from the navigation lights, rotating beacon and strobe light accessories mounted below the spinning propeller.

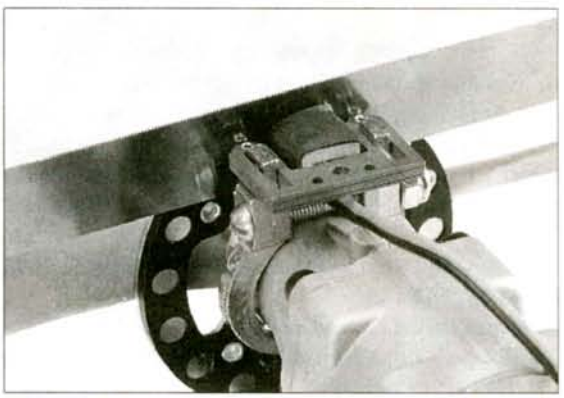
and two spare battery sockets. The accessory sockets are regulated at 5 volts and are limited to 1 amp total output. These only operate when Genesys is supplying generated electricity. The accessory sockets will tolerate a short circuit, over-current or other accessory failure without reducing main battery power to the radio system.

The battery spare sockets are connected directly to the main battery and are either at 4.8 or 6 volts, depending on the main battery voltage. These sockets are used for accessories that draw more than 1 amp (2A maximum) for a short duration, or to operate extra receivers and/or accessories that must operate if the engine stops. Genesys and the main battery will supply power to the battery spare sockets; however, there is no short-circuit or over-current protection.

Plug-to-socket connections on the CCU are too loose. The written instructions address this problem "... we strongly recommend tape or a small dab of glue to prevent all plugs from vibrating loose." On the test stand, I didn't secure the plugs as recommended and experienced two disconnects.



Central Control Unit (CCU) with cover removed.



Using an 0.008-inch razor-saw blade as a spacer between the transformer core and the magnet ring.

GENESYS ACCESSORIES

Genesys accessories are rated by current. Plugged into any of the five accessory sockets, they will not activate until engine rpm exceed idle. Plugged into the battery spare sockets, accessories will activate immediately when the main battery is switched on (radio switch).

All accessory and battery spare sockets have three pins. The center pin is positive and both outside pins are negative. Therefore, polarity is foolproof.

Currently, navigation lights, rotating beacon (simulated), strobe light (simulated), and radio-operated switch are available. Landing lights with an R/C switch will be offered in the future.

This system offers some interesting possibilities to the R/C flyer. With a charging and lighting system like Genesys, maybe I'll go flying on New Year's Eve after all!

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

LATEST PRODUCT RELEASES

HOBBY LOBBY INTL.

Handy HLG

A V-tail design, the Handy HLG has 372 square inches of wing area, an RG15 airfoil and weighs about 12½ ounces. It has a very thin epoxy/glass fuselage shell and a fiberglass tail boom. You can use either mini- or microservos with this model.

Part no.—GR4515; **price**—$139.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

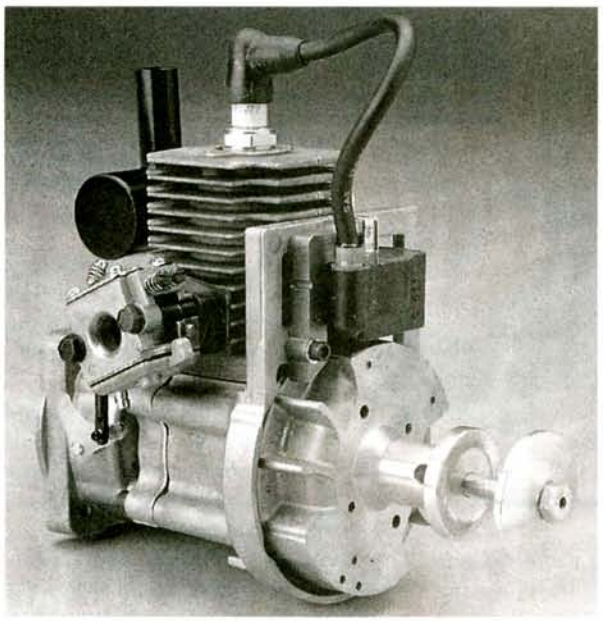
HANGAR 9

Flight Pack Aviation Tote

Measuring 16⅜x8¼x12 inches, this field box has plenty of room for all your flight gear. It comes ready to assemble and features a storage tray, a large drawer and a flip-top battery compartment. The tote can also carry a 1-gallon fuel container. Airplane cradles are available separately.

Part nos.—HAN130 (tote), HAN131 (cradles); **prices**—$29.95, $6.95.

Hangar 9; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; website—www.horizonhobby.com.



U.S. ENGINES

25cc Engine

This engine has an internal, solid-state electronic ignition; ball bearings; a chrome-plated cylinder bore; a dynamically balanced flywheel; a special throttle linkage that adapts the engine to R/C use; a Walbro carburetor; an engine mount; and a Champion RCJ-74 spark plug. Specifications: displacement—1.5ci; bore—1.30 inch; stroke—1.18 inch; output—2.0hp; weight—4.2 pounds; recommended prop—16x8.

Part no.—USEG0025; **price**—$349.99.

U.S. Engines; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300, fax (217) 398-0008.

HOBBICO

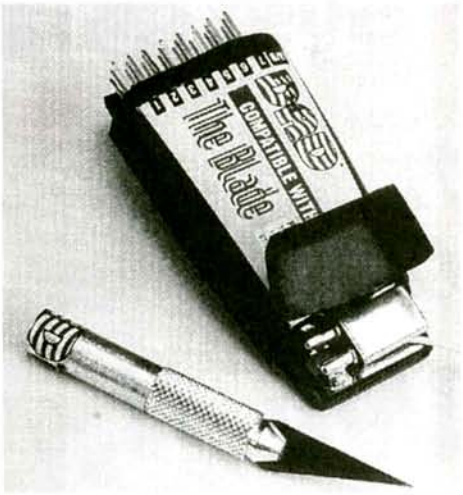
New Quality Tools

The versatile Builder's Triangle set includes interlocking 30/60- and 45-degree triangles that can stand alone to create an angle guide for squaring in two dimensions. The Builder's Ruler features an inch/metric scale and functions as a protractor, a hole/thickness gauge and an upright slot to square ribs.

Part nos.—HCAR0480 (triangle set), HCAR0482 (ruler); **prices**—$7.99, $4.99.

Hobbico; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300, fax (217) 398-0008.

Product NEWS



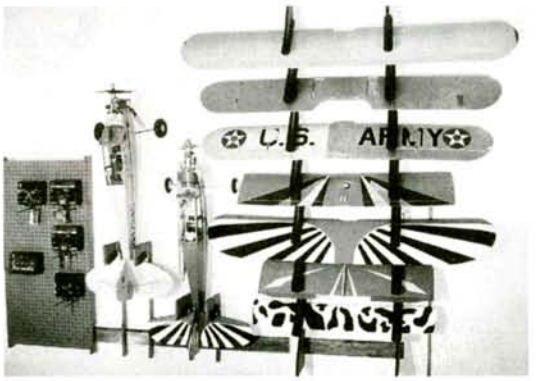
DESIGN AND DEVELOPMENT INC.

DAD® Blade

This 8-channel dual-conversion mini-receiver weighs only 6 ounces and measures ½x1x2⅜ inches. It has the highest sensitivity range available and draws only ½ to ¼ the power drawn by other mini-receivers. The Blade is available for all popular FM radio systems.

Price—$79.95.

Design and Development Inc., 1412 317th Ave. NE, Cambridge, MN 55008; (612) 689-0909.



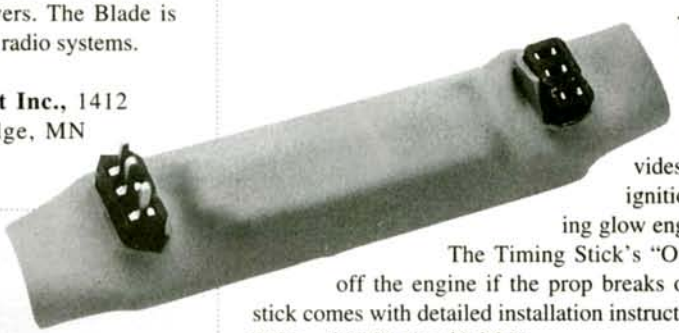
GROVE ENGINEERING AND MFG.

PlaneRax

This modular rack storage system will store up to six wings and two fuselages and has an internal peg-board for storing transmitters and chargers. Adding additional wall-mount rails and rack components is very simple. The wings and fuselages are securely supported by foam cushions, and the rack itself is made of hardwood plywood with a stain finish.

Price—$79.95 plus S&H (starter set).

Grove Engineering and Mfg., RD#1 Box 137, Buskirk, NY 12028; phone/fax (518) 677-3063; email grove_eng@sprynet.com; website http://home.sprynet.com/sprynet/grove_eng.



TEJERA MICROSYSTEMS ENGINEERING INC.

The Timing Stick

This computer-controlled advance timing system provides auto-advance timing pulses for ignition engines and makes converting glow engines to electronic ignition easy. The Timing Stick's "Over-Rev-Kill" feature will shut off the engine if the prop breaks or becomes loose. Each timing stick comes with detailed installation instructions and a 180-day warranty.

Price—$39.95 plus $3 S&H.

Tejera Microsystems Engineering Inc., P.O. Box 340608, Tampa, FL 33694; phone/fax (813) 968-9510.

GREAT PLANES MODEL DISTRIBUTORS

Spinner Weights

Now you can easily add nose weight to alter a model's center of gravity. This precision-machined weight fits inside the spinner, where it is hidden and, being mounted farther from the CG, provides the greatest balancing leverage.

Part nos.—GPMQ4645 (1-ounce weight), GPMQ4646 (2-ounce weight); **prices**—$2.09, $2.19.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.

RYOBI

Power Pen

This multi-purpose rotary detail tool features an ergonomic design with a soft gripping surface, six bits for cutting, grinding, polishing and engraving and a constant-charge stand that automatically recharges the tool's battery. It can be used with glass, metal and wood.

Price—$39.

Ryobi America Corp., 5201 Pearman Dairy Rd., Ste. 1, Anderson, SC 29625-8950; (800) 525-2579.

AIR CARNIVAL '97

It's a Huge Model Airplane Swap Shop!

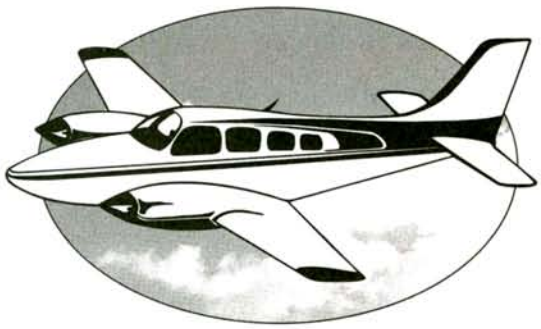
It's a Fun-Fly with long runways and acres of concrete!

It's a visit to one of America's premier Aviation Museums!

April 26th & 27th, 1997 at the Rantoul Illinois Aviation Center
(former Chanute Air Force Base)

Swap Shop

- Swap Shop held inside the Aerospace Museum along side the museum's aircraft and exhibits.
- Hours 9:00 am till 4:00 pm both days. (So vendors can sneak in a little flying time also!)
- Swap Shop/Museum admission $5.00 (Children $3.00). Swap shop tables are $15.00 each (plus admission). Set-up hours are from 6:00-9:00 pm on Friday and from 8:00-9:00 am on Saturday and Sunday.
- Continuous auction.
- Advance ticket sales available.

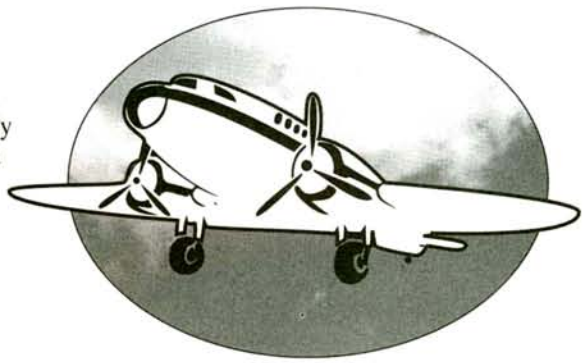


Fun-Fly

- Fun-Fly held on the grounds of the former air force base.
- Current AMA membership required to fly.
- Flying hours 9:00 am till dusk.
- On-site overnight storage available so you don't have to disassemble your airplanes Saturday night.
- Emphasis is on fun! Impromptu contests, prizes and on the spot awards. Prizes for weirdest airplane, ugliest airplane and more. Plenty of excitement for modelers of all abilities.

Museum

- The Octave Chanute Aerospace Museum is the largest aerospace museum in the state of Illinois. Their collection includes: a replica Curtiss Jenny, P-51 Mustang, B-25 Mitchell, B-47 Stratojet, a rare F-101 Voodoo and an even rarer (one of only six remaining) B-58 Hustler bomber and much more. Climb into the cockpit of a B-52 or descend into the worlds only Minuteman ICBM training silo.
- Excellent opportunity for scale modelers to examine and photograph these classic aircraft.
- Guided tours available.



Information

- The Aviation Center is just south of the intersections of Routes 136 and 45 in Rantoul, Illinois or you can fly your private plane directly to the airport.
- Also on base is an 18 hole golf course, camping facilities, restaurants and a health club. Hotel accommodations in Rantoul and 15 minutes south in Champaign-Urbana. Excellent shopping available in Champaign-Urbana and an Outlet Mall is 40 minutes south in Tuscola, IL.
- Call (217) 897-1791 or E-Mail dredden@cu-online.com for information, advance ticket sales and table reservations. Mailing address is: Dave Redden, 3227 Greenwood Dr., Dewey, IL 61840.

CLASSIFIEDS

BUSINESS

SCALE AIRCRAFT DOCUMENTATION and resource guide. Larger, updated 1997 edition. World's largest commercial collection. Over 6,400 different color Foto-Paaks and 35,000 three-view line drawings. 204-page resource guide/catalogue—$8; Canada—$10; foreign—$15. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [3/98]

ANTIQUE IGNITION—GLOW PARTS CATALOGUE, ½-inch THICK. Timers, needle valves, cylinder heads, pistons, tanks, spark plugs, race car parts. Engines ½A, Baby Cyclone, McCoys, Phantoms, etc. $10 postpaid (U.S.), $20 foreign. Chris Rossbach, 135 Richwood Dr., Box 390, Gloversville, New York 12078. [9/97]

RUSSIAN AVIATION AND SPACE HISTORY. For sale: photographs—color or black & white (any size, available framed or unframed) with original signatures of Russian cosmonauts and without (signatures are original, but reproduction). Envelopes with postage stamp, which put on the Baikonur (Russian Cape Canaveral) with original signatures of Russian cosmonauts and without. Autographs guaranteed genuine. 40-year collection of lapel pins, tie tacks, medals (about 1,700, including rare samples)—Soviet aviation and aerospace. Schemes of airplane models such as LI-2, IL-12, IL-76, IL-114, AN-8, AN-12, AN-22 and some others in a scale of 1/72 with all necessary cross-sections. Excellent handcrafted aircraft models of AN-2 and IL-76 (scale 1/72). Gramophone records with original signatures of Russian cosmonauts (voices of Y. Gagarin, S. Korolev, and K. Tsialkovsky). Consultations about Soviet Union and Russia aircraft and space history. SETNA Consulting Co., 1041 N. Stanley Ave., #6, Los Angeles, CA 90046. Phone/Fax (213) 656-0387. [6/97]

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MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952, "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C., Canada VOR 1L1.

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EVENTS

APRIL 28: Elk Grove Village, IL. Chicagoland Radio Control Modeler's 16th Annual Auction & Swap Meet. Al Hattendorf Center, 225 E. Elk Grove Blvd. (corner of Ridge Bl.—½ mile east of Arlington Heights Rd.), Elk Grove Village, IL. 10:00 a.m. - 2:00 p.m. Vendor's setup 8:30 - 10:00 a.m. ($10.00 per table). Doors open 10:00 a.m. Auction @ 12:00 Noon. General Admission $3.00. Vendor's advance reservations accepted. Contact: Dave Crown: 9386 Landings Sq. #507, Des Plaines, IL 60016-5270; (847) 824-6392. [5/97]

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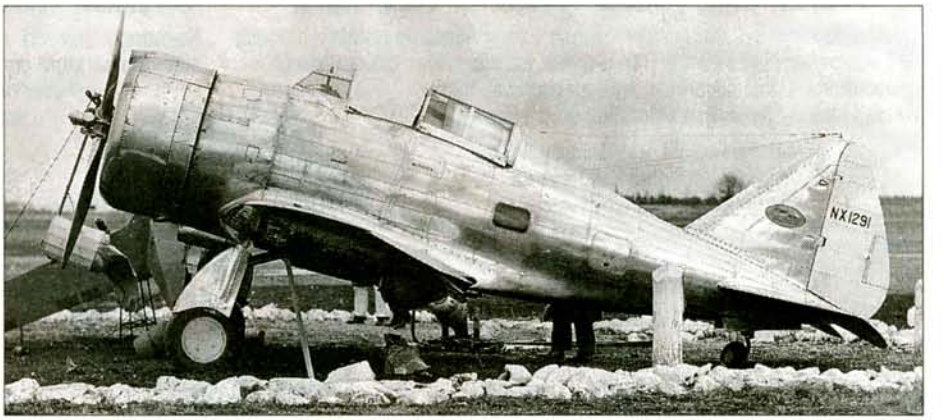
CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.



Gerald Schajatovic of Chesterland, OH, easily identified the February 1997 mystery plane, the Champion Tri-Traveler, because he flew one of these models while he was in the Air Force. Gerald sent a photocopy of the original flight manual, which says that the Tri-Traveler was "basically a conventional, three-control aircraft."

Standard equipment on the plane included a full electrical system, a completely equipped and padded instrument panel, an all-metal propeller, landing and navigation lights and hydraulic and parking brakes. Basic fuselage construction was of welded tube, and the wings were made out of two wooden spars with aluminum-alloy ribs. An efficient 95hp Continental engine on rubber mountings powered the 35-foot, 2-inch-span plane.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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THE FLYING KLAMMER

World champion model aerobatics pilot Hanno Prettner met world champion downhill skier Franz Klammer when Hanno served as flight instructor for Franz and his brother Klaus. As a friend and fan of the champion skier, Hanno wanted to do something to help celebrate the 20th anniversary of Franz's spectacular victory in the 1976 Olympics at Innsbruck.

Well, how about a profile design of a flying skier? We've seen stranger flying objects at the field (how about those stop signs and lawn mowers?). Besides, Hanno realized that model airplanes and skiers really do have something in common, noting that "Downhill racers are in the air for a great part of the time and therefore are subject to the laws of aerodynamics." Building a 10-percent scaled-down, flying version of the champion skier was a piece of cake for this veteran model designer.

Starting with an enlarged photograph of the Olympic champion, Hanno built the Flying Klammer's 3-foot-tall body out of Styrofoam and balsa and its 6-foot, 6-inch-long skis using foam sheeted with obechi and covered with Oracover. He decided to place the R/C equipment and SuperTigre .90 engine on a "mini-wing" between the skis. Hanno knew that ski jumpers control the direction of their flight with the help of their palms, so when he designed the model's control system, he placed elevons at the ends of the skis in addition to the elevons at the end of the "mini-wing." The huge body still produced too much lateral stability, but Hanno resolved this problem after he realized that downhill racers "... use their backsides to a certain degree to control and pilot their race"; thus, the Flying Klammer's posterior functions as the rudder-control flap.

Hanno Prettner (far left) and Franz Klammer pose with the Flying Klammer at Bad Kleinkirchheim.

So, will we see the Flying Klammer at the next World Aerobatics Championships? Probably not; but with Hanno at the sticks, the 7½-pound Styrofoam and balsa model will perform loops, rolls, stall turns and even torque rolls. It certainly turned a few heads at the ski slopes turned flying field.

When Hanno presented the model to the real-life "Flying Klammer," the model's flight characteristics were so good that bystanders thought of organizing a race on Bad Kleinkirchheim's K-70 slope to see which would be faster: Olympic champion Franz Klammer skiing down the slope from the start to the finish or the Flying Klammer "skiing" from the finish up to the start. (Anyone care to place a bet?)

If the Flying Klammer sounds like something you'd like to try, Hanno has some advice: "For the first flight, I recommend a blanket of soft fresh snow that is at least 50cm deep because these snow conditions offer wonderful crash-eliminating qualities!"

—Debra Sharp